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# MEMOIRS

OF THE

# LITERARY

AND

# PHILOSOPHICAL SOCIETY

*OF MANCHESTER.*

VOL. I.

SECOND EDITION.

LONDON:

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M DCC LXXXIX.

TO THE

*K I N G,*

THESE VOLUMES ARE HUMBLY INSCRIBED

BY THE MEMBERS OF THE

LITERARY AND PHILOSOPHICAL SOCIETY

*OF MANCHESTER,*

WITH THE

PROFOUNDEST RESPECT AND LOYALTY:

AND WITH PECULIAR GRATITUDE

FOR HIS GRACIOUS PATRONAGE OF THE

FIRST FRUITS OF THEIR

*INSTITUTION.*

# THE

# PREFACE.

THE numerous Societies, for the promotion of Literature and Philoſophy, which have been formed in different parts of Europe, in the courſe of the laſt and preſent centuries, have been not only the means of diffuſing knowledge more extenſively, but have contributed to produce a greater number of important diſcoveries, than have been effected in any other equal ſpace of time.

The progreſs that has been made in Phyſics and the Belles Lettres, owes its rapidity, if not its origin, to the encouragement which theſe Societies have given to ſuch purſuits, and to the emulation which has been excited between different academical bodies, as well as among the individual Members of each inſtitution. The collecting and publiſhing the more important communications which have been delivered to

them, have ſaved from oblivion many very valuable diſcoveries, or improvements in arts, and much uſeful information in the various branches of ſcience. Theſe their modeſt authors might have been tempted to ſuppreſs, but for the reſpectable ſanction of ſocieties of men of the firſt eminence and learning in their reſpective countries, and the eaſy mode of publiſhing, which their volumes of Tranſactions afford.

Though, in France, Societies for theſe purpoſes have been inſtituted in ſeveral of the provinces, in England, they have almoſt been confined to the Capital; and however great have been the advantages reſulting from the reſearches of the learned bodies, who are incorporated in London, it ſeems probable, that the great end of their inſtitutions, the promotion of arts and ſciences, may be more widely extended by the forming of Societies, with ſimilar views, in the principal towns in this kingdom.

Men, however great their learning, often become indolent, and unambitious to improve in knowledge, for want of aſſociating with others of ſimilar talents and acquirements: Having few opportunities of communicating their ideas, they are not very ſolicitous to collect or arrange thoſe they have acquired, and are ſtill leſs anxious about the further cultivation of their minds.—But ſcience, like fire, is put in motion by colliſion.—Where a number of ſuch men have

have frequent opportunities of meeting and converſing together, thought begets thought, and every hint is turned to advantage. A ſpirit of inquiry glows in every breaſt. Every new diſcovery relative to the natural, intellectual or moral world, leads to a farther inveſtigation; and each man is zealous to diſtinguiſh himſelf in the intereſting purſuit.

Such have been the conſiderations that have led to the inſtitution of the Literary and Philoſophical Society of Mancheſter.—Many years ſince, a few Gentlemen, inhabitants of the town, who were inſpired with a taſte for Literature and Philoſophy, formed themſelves into a kind of weekly club, for the purpoſe of converſing on ſubjects of that nature. Theſe meetings were continued, with ſome interruption, for ſeveral years; and many reſpectable perſons being deſirous of becoming Members, the numbers were increaſed ſo far, as to induce the founders of the Society to think of extending their original deſign. Preſidents, and other officers were elected, a code of laws formed, and a regular Society conſtituted, and denominated, THE LITERARY AND PHILOSOPHICAL SOCIETY OF MANCHESTER.

This Society now preſents the firſt fruits of its inſtitution to the public; and from the aſſiduity of the Members, and the correſpondence of others, there is reaſon to preſume, that a

volume may be regularly ſent to the preſs, every ſecond or third year. The ſelection of the papers has been made with as much impartiality, and as ſtrict attention to their comparative merits, as could be expected, in deciſions of ſo delicate a nature. Yet the committee are ſenſible that a majority of votes, delivered by ballot, is not an infallible teſt of excellence, in literary or philoſophical productions. This conſideration, they truſt, will give them a reaſonable claim to the candour of the reader, if there ſhould be found occaſion for its exerciſe: And they hope that Gentlemen, who have favoured the Society with valuable communications, will deem it no injuſtice or diſparagement, that their Eſſays have not been inſerted, through the imperfection of neceſſary forms and regulations. They are preſerved in the Archives of the Society, and may again come under review, when ſubjects of a ſimilar nature, to thoſe on which they treat, are offered for diſcuſſion. *

No ſyſtematic order has been obſerved, in the diſpoſition of the miſcellaneous materials, which compoſe theſe volumes; becauſe ſuch an

* Several Diſſertations, by Dr. Percival, Mr. Henry, and others, enumerated in the printed Report of the Society, were publiſhed by their reſpective authors, long before theſe Memoirs were committed to the preſs.

arrangement

arrangement would have required the completion of the work, before any part of it could have been committed to the preſs.

The ſanction which the Society gives to the work, now publiſhed, under its auſpices, extends only to the novelty, ingenuity, or importance of the ſeveral memoirs which it contains. Reſponſibility concerning the truth of facts, the ſoundneſs of reaſoning, or the accuracy of calculation, is wholly diſclaimed; and muſt reſt alone, on the knowledge, judgment, or ability of the authors, who have reſpectively furniſhed ſuch communications.

# LAWS AND REGULATIONS

FOR THE GOVERNMENT OF THE

# LITERARY AND PHILOSOPHICAL SOCIETY

# OF MANCHESTER;

TOGETHER WITH A

# LIST OF THE MEMBERS.

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## LAWS.

I. THAT the number of the Members of this Society, inveſted with the privilege of voting, electing members, &c. be limitted to fifty.

II. That Honorary Members, reſiding at a diſtance from Mancheſter, be eligible into this Society, provided no Gentleman be recommended, who has not diſtinguiſhed himſelf by his literary or philoſophical publications; or favoured the Society with ſome paper, which ſhall have received the approbation of the Committee of Papers.

III. That every Candidate for admiſſion into the Society, whether as an Ordinary or Honorary Member, ſhall be propoſed by at leaſt three Ordinary Members, who

who ſhall ſign a Certificate of his being, from their knowledge of him, or of his writings, a fit perſon to be admitted into it: which certificate ſhall be read at four ſucceſſive meetings of the Society, previouſly to the election—Such election, with reſpect to an Ordinary Member, to be void, if he do not attend within four meetings afterwards, unleſs he can plead ſome reaſonable apology.

IV. That every election ſhall be conducted by ballot; That the majority of votes ſhall decide; thirteen Members at leaſt being preſent; and that the Preſident ſhall have a caſting voice, if the number of votes be equal.

V. That two Preſidents, four Vice-Preſidents, two Secretaries, a Treaſurer, and a Librarian, be elected annually, by the majority of members preſent, on the laſt Wedneſday in the month of April: The election to be determined by ballot.

VI. That a Committee of Papers ſhall be appointed, by ballot, at the ſame time, which ſhall conſiſt of the Preſidents, Vice-Preſidents, Secretaries, Treaſurer and Librarian, together with ſix other members of the Society: And that this Committee ſhall decide, by ballot, concerning the inſertion in the Regiſter, or the publication, of any paper which ſhall have been read before the Society; and ſhall be authorized to ſelect, with the conſent of the author, detached parts of any paper, the whole of which may not be deemed proper either for inſertion or publication: But that the preſence of ſeven members of the Committee ſhall be neceſſary for ſuch diſcuſſion, or deciſion.

VII. That Viſitors may be introduced by any Member to the meetings of the Society, with the permiſſion of the Chairman.

VIII. That the ſubjects of converſation comprehend Natural Philoſophy, Theoretical and Experimental Chemiſtry, Polite Literature, Civil Law, General Politics, Commerce,

Commerce, and the Arts. But that Religion, the Practical Branches of Phyſic, and Britiſh Politics, be deemed prohibited; and that the Chairman ſhall deliver his *Veto*, whenever they are introduced.

IX. That each Member, who ſhall favour the Society with any intereſting facts and obſervations, reſpecting Philoſophy, Polite Literature, &c. which may occur to him, either from reflection, experiment, reading, or correſpondence, ſhall ſend his paper to one of the Secretaries, the Monday before the meeting of the Society.

X. That the Secretary, to whom the paper ſhall be delivered, ſhall, with the approbation of one Preſident, or two Vice-Preſidents, have the power of ſuſpending the recital of it, if deemed improper to be read, until the pleaſure of the Committee of Papers be known, a meeting of which ſhall be called by the Secretary to inſpect it: And, if the Committee diſapprove of its being introduced to the Society, they ſhall be empowered to reject it.

XI. That all papers which ſhall be delivered to the Secretary, and not prohibited as above, ſhall be read by him, or the author, according to the order of ſucceſſion in which they were preſented.

XII. That each paper ſhall be read to the Society without interruption; and that more than thirty minutes ſhall not be allowed to the reading of any ſingle paper: If more time be required in the delivery of it, the remainder ſhall, except the Society determine otherwiſe, be deferred to the ſucceeding evening. No paper, however, ſhall engage more than two evenings, without the conſent of the Society expreſſed by a ballot.

XIII. That a ſecond paper ſhall not be read, before the ſubject of the former one has been diſcuſſed.

XIV. That

XIV. That the Society ſhall meet every Wedneſday evening, except during the Months of June, July, Auguſt, and September: And that each meeting ſhall commence at half paſt ſix, and be concluded at half paſt eight o'clock.

XV. That each Member ſhall pay one guinea annually, at half yearly payments, into the hands of the Treaſurer, to defray the rent of the room, and other incidental expences; and alſo, to eſtabliſh a fund for the benefit of the Society. And if any Member ſhall refuſe or neglect to pay his ſubſcription, he ſhall be excluded the Society. Each Member, on his election, to pay his ſubſcription for the current half year, together with one guinea, admiſſion fee.

XVI. That it be recommended to each Member to enter the Society's room with ſilence, and without ceremony.

XVII. That no Laws ſhall be enacted, reſcinded, or altered, but at the quarterly meetings, on the laſt Wedneſdays in the Months of January, April, and October: And that notice ſhall be given, at leaſt fourteen days, previous to thoſe meetings.

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## REGULATIONS.

I. THAT the Society ſhall publiſh a volume of miſcellaneous papers, every two years. And that, at ſtated times, the Committee ſhall ſelect from the papers, which ſhall have been read to the Society, ſuch as ſhall appear to be moſt worthy of publication: But that no papers ſhall be publiſhed, againſt the conſent of the authors.

II. That

II. That a Library be formed for the uſe of the Members of this Society; and that the Librarian be authorized to purchaſe ſuch books, as ſhall be ordered at the quarterly meetings of the Society: But that no books ſhall be taken out of the Library, without a written order from one of the Secretaries, limiting the time of keeping it to ſeven days.

III. That the reſolution to eſtabliſh a Library be announced to the Honorary Members of the Society; and that it be intimated to them by the Secretaries, that donations of their paſt and future publications will be highly acceptable.

IV. That a gold medal, of the value of ſeven guineas, be given to the Author of the beſt Experimental Paper on any ſubject relative to Arts and Manufactures, which ſhall have been delivered to the Secretaries, and read at the ordinary meetings of the Society before the laſt Wedneſday in March 1786.

V. That the adjudication of this premium be referred to the Committee of Papers; that their deciſion ſhall be made by ballot; and that the medal ſhall be delivered by the Preſident, to the perſon to whom it ſhall have been adjudged, or to his repreſentative, at the firſt meeting of the Society in October 1786.

VI. That if the perſon, to whom the medal ſhall have been adjudged, be not one of the Society, his name ſhall be enrolled in the liſt of Honorary Members.

VII. The regular attendance of members being eſſential to the proſperity and uſefulneſs of the Inſtitution, that if any Member ſhall abſent himſelf during the ſpace of three months, from the meetings of the Society, notice ſhall be ſent to him, at a quarterly meeting, that the Society conſiders his abſence as a mark of diſreſpect,

and

and that a more punctual obſervance of the Laws is expected from him.

VIII. To encourage the exertions of young men, who attend the meetings of the Society, as viſitors, that a ſilver medal, not exceeding the value of two guineas, be annually given to any one of them, under the age of twenty-one years, who ſhall, within the year, have furniſhed the Society with the beſt paper on any ſubject of Literature or Philoſophy; and that ſuch adjudication ſhall be made by the Committee of Papers.

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## A LIST OF THE

## MEMBERS.

| | |
|---|---|
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The Rev. Frederick Robert Slater.
Mr. George Wakefield.
Mr. George Walker.
Mr. John Wilſon.

*Thoſe marked thus * are of the Committee of Papers.*

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The Rev. John Whittaker, B. D. F. S. A.

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# EXPLANATION OF THE PLATES

## in VOL. I.

## PLATE I.

Machine for impregnating Liquors with Fixed Air.

E The Effervescing Vessel.

T t The Tubes through which the Air is conveyed.

A The Air-Vessel.

O The Opening through which the Common Air is expelled.

B The Bellows.

W The Water-Vessel.

P p The Pipe through which the Air is drawn into the Bellows.

c c A Pipe forming the communication between the Air and Water-Vessels.

## PLATE II.

Symbols used by the Astronomers and Chemists.

## PLATE III.

A Representation of the Stump of the Humerus mentioned in page 337.

The dotted Line shews the Part where the Arm was amputated.

MEMOIRS

Put

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# MEMOIRS

OF THE

# LITERARY AND PHILOSOPHICAL SOCIETY OF MANCHESTER.

## *Some* REMARKS *on the* OPINION *that the* ANIMAL BODY *poſſeſſes the Power of* GENERATING COLD.

*By* GEORGE BELL, M. D. *Read May* 16, 1781.

A CURIOUS and important diſcovery was announced to the world in the LXV. vol. of the Philoſophical Tranſactions. We are there informed, that Dr. Fordyce and other gentlemen, ſeveral different times, went into a room, the air of which was heated to a degree far above that of the human blood; and though they remained there, ſometimes for the ſpace of half an hour, yet the heat of their bodies was not increaſed by more than 3 or 4 degrees. From hence they concluded, that the living body poſſeſſes a peculiar power of generat-

ing cold by ſome occult operation. The experiments ſeem to have been made with ſufficient accuracy; but the concluſion drawn from them is liable to ſtrong objection. For, in forming it, ſeveral circumſtances have been overlooked, which, in my opinion, afford an eaſy explanation of all the phenomena, on principles already known, without referring them to a new law of the animal body, which probably does not exiſt. Theſe circumſtances I ſhall endeavour to point out.

I. The firſt cauſe which prevented their bodies from receiving a greater increaſe of heat was, *The rarefaction of the air with which they were ſurrounded.*

The quantity of heat which different ſubſtances contain, is, in general, in proportion to their denſity; and, in this proportion, they communicate more or leſs of it to others. A cubical foot of water, contains a much greater quantity of heat, than a cubical foot of air, of the ſame temperature: and, if a third ſubſtance be added, its temperature will be conſiderably changed by the hot water, while by the hot air it will hardly be changed in any perceptible degree. Many facts may be adduced, which ſerve to illuſtrate, and, at the ſame time, are explained by this cauſe. Thus, the ſteam of boiling water will ſcald a perſon's hand, which can ſupport the heat of air, of the ſame temperature. And thus perhaps

haps the weather, when hazy and loaded with vapour, ſeems to our feeling, hotter than when pure and rare; although by the thermometer it is found to be equally warm in both inſtances.

This alſo was the true reaſon why, in making thoſe experiments, Dr. Fordyce always found that he could bear a greater degree of heat in dry, than in moiſt air. But nothing ſhews more clearly the ſlowneſs with which heat is imparted to a denſer ſubſtance, from one that is highly rarefied, than a circumſtance mentioned in the paper in queſtion: "that even the ſmall quantity of mercury, contained in a thermometer which the gentlemen carried with them into the room, did not arrive at the degree to which the air was heated, during the whole time they remained there."

II. Another cauſe which, in the given ſituation, would diminiſh the effect of the heated air, is, *The evaporation made from the ſurface of the body.*

That evaporation produces a conſiderable abſorption of heat is well known: and, in making the experiments, there is reaſon to believe, that it took place in a conſiderable degree. Dr. Fordyce, anxious perhaps to eſtabliſh his general law, ſeems unwilling to allow its influence. But when it is conſidered, that by the operation of the heat, the force of the circulation was increaſed, the pores of the ſkin relaxed, and the preſſure of the internal air diminiſhed; when we are told, that

a turgeſcence of the veins, and an univerſal redneſs of the ſurface of the body, took place; we are compelled to refuſe credit to the aſſertion, even of Dr. Fordyce, that there was no evaporation. The evaporation muſt have been great, and would diminiſh the effect of the external heat by ſurrounding the ſurface with a cool atmoſphere, from its temperature fit for the abſorption of heat, and from its rarity, unfit for the ready tranſmiſſion of it into the body.

III. But another very powerful cauſe of the body's having preſerved its temperature in the given ſituation, remains to be noticed; which is, *The ſucceſſive afflux of blood to the ſurface, of a temperature inferior to that of the ſurrounding air.*—By this means, the ſmall quantity of heat which penetrated the ſkin would be immediately carried off, and transferred throughout the body: and it would have required the ſpace of many hours, before the whole maſs could have received any conſiderable increaſe of heat *.

It has been adduced, in proof of the exiſtence of the power of the living body to generate cold, that frogs, lizards, and other animals of the ſame

* It may here be remarked, that the two laſt mentioned cauſes act more powerfully in moderating the heat of the external air, according to the neceſſity there is for their action: for both the evaporation from the ſurface, and the velocity of the circulation of the blood, are in proportion to the degree of heat applied.

ſort

ſort poſſeſs it; for if touched, they feel cold. This proves only, that their heat is leſs than that of the hand, with which they are felt; and perhaps leſs than that of the air, when the trial is made.

But it is extremely probable, that no animal whatever can live in health, for any conſiderable time, in an atmoſphere of a temperature ſuperior in heat to that of its own blood. Thus we find, that the animals in queſtion hide themſelves in the day-time among thick graſs, where there is a great evaporation; and in places, into which the rays of the ſun cannot penetrate. Worms, in hot weather, during the day, lie deep in the ground; but in the night-time, when it is cool, riſe to the ſurface to refreſh themſelves in the dew. When frogs, worms, and ſuch other animals are expoſed to air warmer than their blood, its influence is counteracted by the ſame cauſes which counteract its influence on the human body, the evaporation from the ſurface of their bodies, and the coldneſs of their blood. Such accidental expoſure happens more frequently to them, than to the human ſpecies; and, from the inferiority of their ſize, they would be ſooner heated through, and leſs able to reſiſt the noxious effects of the hot air, were not their power of reſiſting it made up in another reſpect. In ſuch ſituations, the evaporation from the ſurface of their bodies is greater; for their ſkin is more lax, and is always

covered with moiſture. It is, perhaps, for this purpoſe alſo, that it is rough and uneven; which, by extending the ſurface, cauſes a greater evaporation.

Theſe may be ſaid to be the means through which the human body is preſerved, in nearly the ſame temperature, when it happens to be placed, for a time, in an atmoſphere of a ſuperior degree of heat. They ſeem to me ſo adequate to this effect, that I would even venture to impute the increaſe of the temperature of the body, from 96 to 100 degrees, which happened in the experiments, rather to the acceleration of the blood, than to the influx of heat from the external air. While the cauſe of animal heat remains unknown, it would be preſumption to aſſert, that theſe are the only means, by which the body is enabled to reſiſt the effects of external heat. There may be others; and it is not unreaſonable to ſuppoſe, that as external cold, perhaps by its tonic influence, increaſes the power of the body to generate heat, ſo external heat may diminiſh that power, and thus leſſen the quantity of heat generated within, while the evaporation, produced by the ſame cauſe, guards it againſt receiving any acceſſion from without.

## *On the Advantages of* LITERATURE *and* PHILOSOPHY *in general, and eſpecially on the conſiſtency of* LITERARY *and* PHILOSOPHICAL *with* COMMERCIAL PURSUITS. *By* THOMAS HENRY, F. R. S. *Read October* 3, 1781.

> To either India ſee the merchant fly,
> Scar'd at the ſpectre of pale poverty!—.
> See him with pains of body, pangs of ſoul,
> Burn thro' the tropic, freeze beneath the pole!
> Wilt thou do nothing for a noble end,
> Nothing to make philoſophy thy friend?
>
> Pope's Imitations of Horace, Epiſt. I. Book I.

THE purſuit of knowledge, when properly directed, and under due influence, is of the greateſt importance to mankind. In proportion as a nation acquires ſuperior degrees of it, her ſtate of civilization advances, and ſhe becomes diſtinguiſhed from her leſs enlightened neighbours by a greater refinement in the manners of her inhabitants, and a departure from thoſe ferocious vices, which mark the features of ſavage countries. Vices ſhe will, indeed, ſtill be addicted to, but of a different complexion from thoſe of her more uncultivated days. For, wherever a love of learning and the arts makes any conſiderable progreſs, even crimes themſelves loſe ſomething of their atrociouſneſs, and, though ſtill offenſive, are diveſted of thoſe ſtrong marks of brutality, which generally accompany ignorance. The

horrors of war itſelf are ſoftened: an enemy is treated with humanity and kindneſs: the milder virtues find admittance amongſt the claſh of arms; and men, when compelled to hoſtilities, ſeek victory, not to *enſlave* or deſtroy, but in the moment of triumph rejoice in opportunities to evince their clemency and generoſity to the vanquiſhed foe.

That this picture is not too ſtrongly coloured will appear from an appeal to hiſtory. In the earlier ages, we ſee a conquering army hurling deſtruction and deſolation, murder and rapine around them, and, with unrelenting fury, ſcarcely diſtinguiſhing between friends and enemies. In theſe more poliſhed times, and the poliſh may be fairly attributed to the diffuſion of learning and philoſophy, ſuch cruel exceſſes are diſcountenanced and prohibited by the general conſent of every civilized people.

Nor are theſe improvements confined to national manners: thoſe of individuals have been equally benefited. The natural tendency of a cultivation of polite learning, is, to refine the underſtanding, humanize the ſoul, enlarge the field of uſeful knowledge, and facilitate the attainment of the comforts and accommodations of life.

How great is the contraſt between the characters of the elegant ſcholar, and the man whoſe uncultivated mind feels no reſtraint, but thoſe which

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the laws of his country impoſe! A taſte for polite literature, and the works of nature and of art, is eſſentially neceſſary to form the Gentleman, and will always diſtinguiſh him more completely from the vulgar, than any advantage he can derive from wealth, dreſs, or titles. Theſe external decorations, without thoſe refined manners which proceed from a proper ſtudy of books and men, ſerve only to render his ignorance more conſpicuous; whereas a man of a polite imagination, not only ſecures himſelf a favourable reception in the world, but as Mr. Addiſon obſerves, "is let into a great many pleaſures that the vulgar are not capable of receiving. He can converſe with a picture, and find a companion in a ſtatue. He meets with a ſweet refreſhment in a deſcription, and often feels a greater ſatisfaction in the proſpect of fields and meadows, than another does in the poſſeſſion. It gives him a kind of property indeed in every thing he ſees, and makes the moſt rude and uncultivated parts of nature adminiſter to his pleaſures."*

Affluent circumſtances and abundant leiſure give the Gentleman great advantages over his inferiors, in the more refined ſtudies. The cold and heavy hand of poverty chills and repreſſes the efforts of genius; wealth cheriſhes, and, if I may be allowed the metaphor, *manures* and

* Spectator, No. 411.

puſhes

puſhes it forward to maturity. Sometimes, indeed, in ſo rich a ſoil, weeds will ſpring, which, if not timely rooted up, may endanger the ſafety and health of the nobler plant. But a careful cultivator will exterminate them early, and ſeduloufly prevent their deleterious effects.

The importance of the Gentleman will ſtill riſe higher, his mind be enlarged, and his pleaſures be increaſed, if, to the accompliſhments of the polite ſcholar, he add the knowledge of the philoſopher, and endeavour with a noble ambition,

> Thro' vaſt immenſity to pierce;
> See worlds on worlds compoſe one univerſe;
> Obſerve how ſyſtem into ſyſtem runs,
> How other planets circle other ſuns. *

Deſcending from this ſtupendous elevation, he will find this globe, which we inhabit, an ample field for phyſical enquiries. Beſides, that man himſelf is the proper ſtudy of mankind, he will find the whole univerſe replete with ſubjects for his contemplation. The air, the ocean, the vegetable and animal creation, the ſurface of the earth, and her moſt profound cavities to which human induſtry has reached, will all ſupply abundant food for his intellectual powers, furniſh him with infinite ſources of amuſement, ſhew to his wondering eye

> All matter quick and burſting into birth. †

* Pope's Eſſay on Man, Ep. I. † Ibid.

and

and teach him to admire that wiſe, that omniſcient Being, whoſe ſuperintending providence inſpects and regulates the whole, even the moſt minute parts of his creation,

> And ſees with equal eye, as God of all,
> A hero periſh, or a ſparrow fall.*

I believe, few will controvert the advantages I have pointed out, as ariſing to the Gentleman and profeſſionaliſt, from the ſtudy of the Belles Lettres and philoſophy; but I am ſorry to ſay, many are the adverſaries we have to encounter, if theſe arguments be extended to another wealthy claſs of men—the Merchant and Manufacturer. The commercial man, ſay they, ſhould confine his knowledge to trade. His compting-houſe ſhould be his ſtudy; his ledger his hourly amuſement. Gold and ſilver are the only metals with which he ought to be acquainted; and of theſe to know no more, than the different coins into which they are formed, and the current price of bullion. For poetry, painting and muſic, he muſt have no attachment, no taſte for engravings, but thoſe of bank bills, and, if a ſingle philoſophical idea ſhould enter his head, theſe inveighers againſt knowledge would expect to ſee his name immediately in the liſt of bankrupts.

* Pope's Eſſay on Man, Ep. I.

To

To be ſerious—So far have theſe prejudices extended, that many parents entertain the moſt diſmal apprehenſions of their ſons acquiring a taſte for literature, and look on an inclination to natural philoſophy as highly dangerous to their progreſs in trade. Behold, ſay they, that wealthy manufacturer! Without any knowledge, beyond that of the goodneſs of his raw materials, and of judging whether his wares were properly fabricated and finiſhed, joined with a tolerable acquaintance with figures, and a moſt cautious prudence, he has amaſſed an affluent fortune. On the other hand, ſee that *man of erudition!* Inſtead of attending to the manufacture of his goods, his time was employed in reading hiſtory; inſtead of keeping his books, and ſtating his accounts, he was ſolving problems in Euclid, or making chemical experiments in order to effect new diſcoveries, when he might have availed himſelf of thoſe already made, by the labour and at the expence of others. His refined ideas had taught him that ſuſpicion is mean, and his learning and credulity have plunged him into ruin.

Theſe are ſpecious but deceitful repreſentations. That an imprudent young man may, by devoting thoſe hours to philoſophical or literary purſuits, which ought to have been given to buſineſs, have precipitated himſelf into poverty and diſtreſs, cannot be denied. But the miſchief ariſes, not from a taſte for thoſe ſtudies, but from the improper arrange-

arrangement of time. Want of œconomy in this point is equally, if not more injurious, than in pecuniary matters.

It will be alſo allowed, that the profeſſion, in which each individual is engaged, ſhould, next to the more important intereſts of religion, attract and employ his principal attention. But the mind of man, and eſpecially of young men, muſt be provided with amuſements. The young tradeſman of fortune has generally many hours of leiſure, and if amuſements be neceſſary to ſooth the rugged paths of buſineſs, ſhall we chooſe thoſe which lead to diſſipation, to extravagance, to vice, or ſuch as tend to civilize the mind and improve the underſtanding, by developing the operations of nature, explaining the nice connection which ſubſiſts between the loweſt and higher order of beings,

> To man's imperial race,
> From the green myriads in the peopled graſs;

and tracing the hand of Omnipotence through every link of that

> Vaſt chain of being, which from God began,
> Nature's etherial, human, angel, man,
> Beaſt, bird, fiſh, inſect, what no eye can ſee,
> No glaſs can reach. *

Will not the time he can ſpare from buſineſs be more uſefully employed in the ſtudy of hiſtory,

* Pope's Eſſay on Man, Ep. I.

and

and the reading of our beſt authors; or at an air pump, an electrical machine, or a microſcope, than, as is too often the caſe with thoſe youths who have not received that culture which their fortunes entitled them to, at the tavern, the gaming table, or the brothel; or, if their minds be not ſufficiently active, and paſſions ſtrong, to impel them to theſe exceſſes, in idleneſs, low company, and mean and degrading purſuits? "There are indeed, but very few," ſays an excellent obſerver of human nature, "who know how to be idle and innocent, or have a reliſh of any pleaſures that are not criminal; every diverſion they take is at the expence of ſome one virtue or another, and their very firſt ſtep out of buſineſs is into vice or folly. A man ſhould endeavour, therefore, to make the ſphere of his innocent pleaſures as wide as poſſible, that he may retire into them with ſafety, and find in them ſuch a ſatisfaction, as a wiſe man would not bluſh to take."

The arguments, which have hitherto been adduced in favour of commercial men endeavouring to attain liberal knowledge, have been principally confined to thoſe, whoſe parents have already acquired ſuch fortunes, as raiſe their ſons above the level of the more neceſſitous tradeſman, in whom a greater degree of aſſiduity in buſineſs is neceſſary. But, even in this caſe, if his diligence and application degenerate into an inordinate deſire of accumulating wealth, and this

*ruling*

*ruling paſſion* be allowed to *conquer reaſon*, to ſuppreſs every wiſh of the mind for improving and fitting itſelf for higher enjoyments in this life, and the participation of ſtill more exalted pleaſures in a future ſtate, it then becomes criminal, and ought to be reſiſted.

But it may be ſaid, that all men are not intended by nature for ſcholars or philoſophers; and that there are ſtations in life that will not admit of profound ſtudy and inveſtigation. Yet there are few, whoſe minds may not receive a bias to ſome uſeful reſearch, whereby they may be pleaſingly and uſefully employed. And we may be bold to aſſert, that, though it is not in the power of every man to ſhine as a diſtinguiſhed literary character, yet there is ſcarcely any one ſo meanly ſituated, as to render ſome ſhare of learning inconvenient to him; or who will be a worſe man, or a worſe member of ſociety, by having advanced a few ſteps higher in the ſcale of human knowledge.

Nemo adeo ferùs eſt, ut non miteſcere poſſit,
Si modo culturæ patientem commodat aurem. *

It is one thing to be a *profeſſed* ſcholar or philoſopher, and another, to poſſeſs ſuch a degree of information on a ſubject, as is compatible with our other avocations. To be a *complete* aſtro-

* Horatii, Epiſt. I. Lib. I.

nomer

nomer would almoſt monopoliſe the buſineſs of a man's life. To procure a *general*, but ſatisfactory idea of the motions of the planetary ſyſtem; of the diſtance of the ſun from the earth, and of the yet more immenſe diſtance between us and the fixed ſtars, &c. only a moderate degree of application is requiſite.

Among thoſe objects of ſtudy which may be recommended to the attention of the young tradeſman, ſome may be conſidered as ornamental, while others deſerve to be claſſed in a higher rank, with reſpect to the utility he may expect to receive from the cultivation of them; and of theſe again, ſome may be more particularly adapted to ſome branches of trade than others.

A knowledge of hiſtory is an indiſpenſible accompliſhment to the opulent tradeſman. Hiſtory has been elegantly and emphatically deſcribed by a poet, who is an honour to the age and country in which he writes;

> Nature's clear mirror! life's inſtructive guide!
> Her wiſdom ſour'd by no preceptive pride!
> Age from her leſſon forms its wiſeſt aim,
> And youthful emulation ſprings to fame. *

That of our own country, in particular, ſhould attract the regard of the commercial ſtudent. Few hiſtories afford more intereſting matter than that of this iſland. How muſt the heart of a Briton

* Hayley's Eſſay on Hiſtory.

burn

burn within him, when he reads of the glorious ſtruggles which our anceſtors, through many ages, have made to ſecure to us that liberty we now ſo amply enjoy! How cloſely ſhould he graſp that ineſtimable jewel which has been purchaſed by the blood of ſo many heroes! How muſt he glory in that conſtitution which renders Great Britain the object of univerſal envy and admiration!

Nor are the objects of hiſtory confined to the atchievements of war, the revolutions of governments, and the intrigues of ſtateſmen. The origin and progreſs of commerce and of arts, come alſo within her province. And the philoſophical hiſtorian does not content himſelf with the mere relation of facts; he endeavours to trace effects to their cauſes, to ſhew the principles by which commerce ſhould be actuated; how the various intereſts, ſituations and connections of different countries ſhould lead to different kinds of traffic; and in what manufactures the particular genius of a people may fit them to excel. Such diſquiſitions as theſe have lately tended to the eſtabliſhment of a new ſyſtem which may be, not improperly, denominated commercial philoſophy. Here the tradeſman is more immediately concerned. Theſe are ſubjects which come directly within the ſphere of his inquiries.

The Engliſh Claſſics will be a rich fund of entertainment and improvement. Shakeſpeare, Milton, Pope, Addiſon, Thomſon, Gray, Maſon,

with a long liſt of excellent writers in proſe and verſe, will yield him charming refreſhments, after the fatigues of the day. He may even indulge himſelf in ſweet converſe with the fair ſex. A Montague, a Carter, a Barbauld and a Seward, juſtly demand his notice, and will prove moſt delightful companions, refine his taſte, poliſh his manners, and meliorate his morals.

The ſciences of Natural Hiſtory and Botany require ſo much time to be devoted to the ſtudy of them, and ſuch minute inveſtigation, that, however *pleaſing*, they may be juſtly conſidered as *improper* objects for the man of buſineſs to purſue *ſcientifically*, ſo as to enter into the exact arrangement and claſſification of the different bodies of the animal, vegetable, and mineral kingdoms. But reading, and perſonal obſervation, will ſupply him with ample matter for reflection and admiration. He will ſee the great univerſal cauſe actuating every part of nature. He will ſee animals, which a leſs accurate obſerver beholds with the moſt contemptuous eye, executing works far above human abilities to perform. He will behold them acting, and conducting their affairs, with a prudence and foreſight, which, whether it be the effect of reaſon or of inſtinct, may juſtly humble the pride of human wit. With what attention has Providence beſtowed on the various claſſes of animals, thoſe endowments which are particularly adapted to their

their reſpective functions! Perhaps man, that lord of the creation, as he vainly boaſts himſelf, is indebted for many uſeful leſſons to very inferior animals. The voice of Nature is thus deſcribed as crying out to him,

Go from the creatures thy inſtruction take;
Learn from the birds what food the thickets yield;
Learn from the beaſts the phyſic of the field;
The arts of building from the bee receive;
Learn of the mole to plow, the worm to weave;
Learn of the little nautilus to ſail,
Spread the thin oar, and catch the driving gale.

But ſeveral branches of Natural Philoſophy ſeem peculiarly adapted to fill up the vacant hours in which the tradeſman can withdraw from his employments. A general knowledge of all will tend to open and enlarge his underſtanding, at the ſame time that it affords him the moſt rational amuſement. While the ſtudy of ſome, *in particular*, may not only tend to effect theſe deſirable purpoſes, but ſupply him with a kind of information which may turn to good account, by furniſhing him with the means of extending his commercial concerns, and conducting them to greater advantage; of improving thoſe manufactures in which he is already engaged, or inventing new fabrics, which may give additional life and ſpirit to trade.

As Pneumatics, or the doctrine of the nature and properties of air, diſplay an ample field of inveſtigation to the philoſopher, ſo will they alſo

ſupply, to the more ſuperficial inquirer, much inſtruction and entertainment. Every man is intereſted in the properties of a fluid to which he is ſo intimately related, and without which, he cannot ſubſiſt a moment. Its various degrees of gravity, elaſticity, heat, moiſture, and purity, all affect the human race. Many of the moſt dire diſeaſes which afflict mankind, are occaſioned by noxious impregnations of the atmoſphere, or cured by more favourable ſtates of it. And many of the operations of nature and art are eſſentially influenced by the changes which are continually occurring in it.

Philoſophy has lately made moſt rapid advances in diſcovering the conſtitution of common air. The ingenious Dr. Prieſtley has even taught us the art of fabricating it artificially, of producing it in a degree of purity far exceeding that of the moſt ſalubrious climate, and of reducing it to the ſtate in which we commonly breathe it when debaſed by exhalations from the various bodies which it ſurrounds. From him we have alſo learned a mode of judging of the different degrees of purity in air, by means of the eudiometer, as of its gravity and heat by the barometer and thermometer. This excellent philoſopher, to whom, as a learned foreigner has obſerved, "Nature takes delight in revealing her ſecrets," has alſo firſt diſcovered, and Dr. Ingenhouſe, treading in his paths, has more completely

completely demonſtrated the method by which Nature makes uſe of the leaves of vegetables to purify the atmoſphere, when contaminated with putrid or phlogiſtic vapours. When in this ſtate, every leaf acts as a ſtrainer to the air, imbibing and applying to the nurture of the plant, ſuch parts as are unfit for animal reſpiration, and throwing it out, thus filtered and ſuited to act again as a menſtruum for the phlogiſton, which is continually evolving by the breathing of animals, the corruption of vegetables, and by the many various proceſſes which are by nature and by art continually carrying on.

Electricity is another branch of ſcience which has afforded great light to the operations of nature. A knowledge of its leading principles, and a dexterity in making a number of entertaining experiments, may be attained by moderate application, and thereby, a field of amuſement opened to the mind, at an eaſy expence of time and money.

To obtain a perfect acquaintance with the ſcience of Optics, much attention and cloſe application would be requiſite. Such a knowledge of it, however, as is ſufficient for general purpoſes, is eaſily arrived at. The nature of the reflection and refraction of the rays of light, of viſion, and of colours, the properties of lenſes, are uſeful and entertaining objects of inquiry. But the very minute diviſibility of the rays of light

fills the mind with aſtoniſhment. When we are informed, that there proceeds more than 6,000,000,000,000 times as many particles of light from a candle, in a ſecond of time, as the whole earth contains grains of ſand, ſuppoſing each cubic inch of it to contain 1,000,000; when we are told that light in its paſſage from the ſun to the earth, moves with the immenſe velocity of 95,173,000 miles in ſeven minutes and a half, we are impreſſed with the moſt profound veneration for that Almighty Being, who has ſo wiſely adjuſted the proportions between the bulk and velocity of theſe rays, as to make them anſwer all his benevolent intentions to mankind; whereas, an increaſe or decreaſe in the one or the other, might have been fatal to the animal and vegetable world.

By the Teleſcope and Microſcope our eye is enabled to reach far beyond the limits of our natural viſion. By the former, objects, at conſiderable diſtances, are brought, as it were, within our graſp, and we can ſoar upwards into other worlds. By the latter, we are impowered to ſearch into the minutiæ of nature, to admire the delicacy of her operations, and the wonders of creation, exhibited in the perfect fabrics of the ſmalleſt animals and plants.

The acquiſition of knowledge in the ſciences which we have already recommended, may perhaps be conſidered rather as amuſing and ornamental,

mental, than neceſſary. But there are other branches of natural philoſophy which may be deemed highly uſeful and important to commercial men. Theſe are Geography, Mechanics, and Chemiſtry.

Geography is ſo cloſely connected with commerce, that it would be almoſt as great a reflection on the merchant to be ignorant of it, as of the rules of Arithmetic. Shall the man, whoſe veſſels traverſe every quarter of the globe, be unacquainted with its form, its motion, its diviſions, its kingdoms, ſeas, rivers, lakes, iſlands and mountains? Shall he be uninformed of the nations and people with whom he traffics, their perſons, manners, cuſtoms, governments and religion? Are not the flux and reflux of the tides, the ſituation and courſe of currents in particular ſeas, and the direction of thoſe winds, which prevail in certain ſeaſons and latitudes, phenomena, into the nature and cauſes of which he is intereſted to inquire? And, above all, ſhould he not endeavour to know the produce of every country, and the articles, which, not being ſupplied in their own climate, may be moſt acceptable objects of commerce to the inhabitants?

The remaining branches come more immediately within the province of the manufacturer. Manufactures bear ſo intimate a relation to the Mechanical Powers, as to be incapable of ſubſiſting, in any degree of vigour, without their

ſupport. How tedious, how expenſive, and how imperfect would many operations be found, if performed by the mere efforts of human ſtrength, or manual ſkill, unaſſiſted by mechanical aid! The mechanic powers facilitate their performance, and render their products more complete. How much do we owe to them for the improvement and extenſion of the manufactures of this town! I am addreſſing a ſociety, *all* of whom are daily eye-witneſſes of the beneficial conſequences which have ariſen from theſe improvements; *ſome* of whom are reaping the fruits of them. It would be ſuperfluous, it would be impertinent to enlarge on the ſubject: for it muſt be evident, that as Mechanics are ſo eſſentially neceſſary to manufactures, a knowledge of their principles muſt be uſeful to every man engaged in ſuch branches of trade.

With Mechanics, Hydroſtatics and Hydraulics are ſo cloſely connected, that a knowledge of them may be conſidered as a neceſſary adjunct. For, on the principles of theſe ſciences often depends the firſt movement of the moſt complete machines; and fire and water engines, mills, aqueducts, pumps, and other mechanical ſtructures, can only be brought into action by their aſſiſtance.

Nor is the utility of Chemiſtry more confined, or leſs connected with manufactures, than Mechanics,

chanics. Indeed Chemiſtry may be, not improperly, called the corner ſtone of the arts. They not only are ſupported by her, but many of them derive their very exiſtence from this ſource. She even furniſhes inſtruments to every one of the branches of natural philoſophy we have enumerated. The truth of this propoſition will be evinced, when it is conſidered that metals cannot be ſeparated from their ores, nor glaſs produced without her aid. She ſupplies the aſtronomer with his lenſes, and the mathematician with his inſtruments. The air pump, electrical, hydroſtatical and hydraulic machines cannot be conſtructed without her intervention; and ſcarcely a piece of mechaniſm is formed, to which ſhe does not contribute ſomething.

In the finer arts the influence of Chemiſtry is very conſpicuous. To her the painter owes moſt of thoſe colours, by which he is enabled to give the reſemblances of diſtinguiſhed perſonages to the inquiring eye of a grateful poſterity; to place before their view, more clearly than words can expreſs, the martial deeds of the hero, and the firm virtue of the patriot; and to repreſent thoſe beauteous ſcenes of nature, to the deſcription of which, language is inadequate. Without Chemiſtry, the fine colouring of a Titian could never have delighted the enraptured beholder. Nay, even the works of the philoſopher, the

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hiſtorian and the poet, are indebted to her for their diffuſion and permanency.

To ſhew the advantages ariſing from this ſcience in all the arts through which they might be traced, would carry me far beyond the limits of my preſent deſign. It may be ſufficient to point out the connection which ſubſiſts between Chemiſtry, and thoſe manufactures which are the pride and glory of this reſpectable commercial town.

Bleaching is a chemical operation. The end of it is to abſtract the oily and phlogiſtic parts from the yarn or cloth, whereby it is rendered more fit for acquiring a greater degree of whiteneſs, and abſorbing the particles of any colouring materials to which it may be expoſed.

The materials for this proceſs are alſo the creatures of Chemiſtry, and ſome degree of chemical knowledge is requiſite to enable the operator to judge of their goodneſs. Quick-lime is prepared by a chemical proceſs. Pot-aſh is a product of the ſame art; to which alſo vitriolic, and all the acids owe their exiſtence. The manufacture of ſoap is alſo a branch of this ſcience. All the operations of the whitſter; the ſteeping, waſhing and boiling in alkaline lixiviums; expoſing to the ſun's light, ſcouring, rubbing and blueing are chemical operations, or founded on chemical principles. The ſame may be

be ſaid of the arts of dying and printing, by which thoſe beautiful colours are impreſſed on cloths, which have contributed ſo largely to the extenſion of the manufactures of this place. How few of the workmen, employed in them, poſſeſs the leaſt knowledge of the ſcience to which their profeſſion owes its origin and ſupport! If random chance has ſtumbled on ſo many improvements, what might induſtry and experience have effected, when guided by elementary knowledge? The misfortune is, that few dyers are chemiſts, and few chemiſts dyers. Practical knowledge ſhould be united to theory, in order to produce the moſt beneficial diſcoveries. The chemiſt is often prevented from availing himſelf of the reſult of his experiments, by the want of opportunities of repeating them at large: and the workman generally looks down with contempt on any propoſals, the ſubject of which is new to him. Yet under all theſe diſadvantages, I believe it will be confeſſed, that the arts of dying and printing owe much of their recent progreſs to the improvements of men who have made Chemiſtry their ſtudy. Much however remains to be done; and perhaps in no reſpect are the manufactures of this country more defective than in the permanency of their colours. Senſible as our manufacturers are of this defect, is it not ſtrange, that ſo few of them ſhould attempt to acquire a knowledge of thoſe principles which would

would moſt probably ſupply them with the means of improving and fixing their dyes?

This ſubject would afford matter for very extenſive diſquiſition; but I fear I have already treſpaſſed on the patience of the ſociety. Suffer me, therefore, only to requeſt your indulgence while I point out one other ſource of improvement and pleaſure, conſiſtent with the purſuits, and frequently advantageous, and even neceſſary to the buſineſs of the tradeſman.

A taſte for the Polite Arts, eſpecially thoſe of drawing and deſign, ſhould appear a deſirable acquiſition to the manufacturer of the finer and more elegant wares. If not poſſeſſed of this, he is always dependent on others for the patterns of his fabrics. Whereas, were he capable of inventing them himſelf, he would poſſeſs conſiderable advantages over his leſs accompliſhed neighbours. His imagination would continually ſupply him with ſomething new; and of what importance novelty is, in theſe times of faſhion and fancy, every day's experience furniſhes convincing proofs. It is this ſupereminent taſte that has diſtinguiſhed the productions of a Wedgwood and a Bentley above all their competitors in the ſame line of buſineſs. Such a taſte would doubtleſs be equally beneficial to the manufacturer of the fine cotton and ſilk goods of Mancheſter; and he would be enabled to equal

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in elegance of pattern, as he excels in ſtrength of fabric, the manufactures of our neighbouring and inimical rivals.

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## *On* Crystallization. *By* Alexander Eason, M. D. *Read November* 14, 1781.

ALTHOUGH Nature always acts by general and not by partial laws, yet the particular mode of her operations is frequently removed beyond the limited powers of the human underſtanding. The truth of this obſervation is ſtrongly confirmed by all the phenomena in the cryſtallization of ſalts and other ſubſtances, which, under proper circumſtances, never fail to ſhoot into maſſes or cryſtals, with more or leſs regularity, according to the manner in which the proceſs may have been carried on.

Moſt bodies, during their paſſage from a fluid to a ſolid ſtate, ſeem to diſcover a tendency to form themſelves into regular maſſes of a conſtant or given form. This tendency is highly conſpicuous in the various kinds of ſaline ſubſtances, and perhaps is dependent on a law of nature which exerts itſelf, in a more general manner, than philoſophers are apt to imagine.

To me it ſeems highly probable, that the cryſtallization of ſalts, the freezing of water, the

the formation of precious ſtones, baſaltes, &c. are all the effects of the ſame cauſe; and if we conjecture that the ſetting of metals is a ſpecies of cryſtallization, we ſhall not be wide of the truth. This much is certain, that all the ſemi-metals, when broken, diſcover a laminated texture, and in each particular metal theſe lamina are always of a given or conſtant form.

That we may, therefore, proceed with due perſpicuity, it will be neceſſary to take a nearer view of the ſubject, and to conſider, ſhortly, the phenomena attending the cryſtallization both of ſimple and compound bodies. The cryſtallization of a ſimple cryſtallizable body may be affected merely by removing the cauſe of its fluidity, ſince by this means, its component parts will have an opportunity of arranging themſelves into maſſes more or leſs regular and tranſparent, according to the nature of the body, and the law of its cryſtallization.

The leaſt reflection will ſerve to diſcover, that bodies may be converted from a ſolid to a fluid ſtate, in two different ways, viz. either in the way of ſolution, or fuſion by heat.

Of the firſt, we have endleſs examples from the ſolution of ſalts in water, and other fluids; and the ſecond may be very well illuſtrated by the proceſs of making glaſs. *

* In the LXVI vol. of the Phil. Tranſ. No. 34, Mr. Keir gives an account of glaſs forming cryſtals when it paſſes from a fluid to a ſolid ſtate by ſlow degrees.

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In the firſt of theſe caſes, the cryſtallization is carried on by the ſeparation of the fluid which keeps the cryſtallizable body in a ſtate of ſolution; and in the ſecond, the ſame effect is produced by the cooling of the materials, or the extraction of their heat. If, for inſtance, a ſolution of the foſſil fixed alkali in water be firſt evaporated to a pellicle, and afterwards be ſuffered to cool gradually, without being diſturbed, the ſalt will ſhoot into beautifully tranſparent cryſtals; and in like manner, if water be deprived of that degree of heat which is requiſite to preſerve it in a fluid ſtate, it will ſhoot into radii or needle-like cryſtals, which, at their union, form conſtant angles of 60 degrees. If, however, the water in the firſt caſe, and the heat in the ſecond, be ſeparated with too much rapidity, the cryſtals will be ſmall, and more or leſs irregular, according to the celerity with which the proceſs may have been conducted. The ſame obſervations are equally applicable to all bodies of the cryſtallizable kind.

Although, in general, every cryſtallizable ſubſtance diſcovers a manifeſt tendency to ſhoot into maſſes or cryſtals of a peculiar form, yet we muſt here obſerve, that the forms of thoſe cryſtals are liable to great variation from various circumſtances attending their formation.

Gypſum, for example, is well known to be a vitriolic ſalt with a calcareous baſis, and yet the

the ſubſtance is preſented to us by nature in five different ſhapes, to each of which naturaliſts have given different names; firſt, the Lapis Specularis. 2dly. Striated Gypſum. 3dly. Gypſeous Alabaſter. 4thly. Selenites, properly ſo called. 5thly. A Gypſeous Spar, frequently found adhering to the ſides of veins in mountains, particularly thoſe incloſing the ores of metals. All theſe ſubſtances when chemically examined, exhibit preciſely the ſame phenomena, and are, in reality, nothing but different cryſtallizations of the ſame compound ſalt. *

Beſides the gypſums, there is another ſubſtance, which though claſſed by naturaliſts with earthy bodies, is nevertheleſs a compound ſalt, and, like the gypſums, has a natural tendency to cryſtallize or ſhoot into maſſes of regular forms. This ſubſtance ſtrongly promotes the fuſion of earthy ſubſtances, particularly theſe of the calcareous and argillaceous kind, and on this account is generally denominated a fluor or flux, but,

* La nature fournit beaucoup de matiere ſaline de même eſpece que celle dont nous parlons (viz. ſelenite) mais qui a differentes formes, & à laquelle les naturaliſtes ont donnê differentes noms comme gypſe ou miroir d'Ane, pierre a platre, albâtre, ſpath gypſeux, &c. mais toutes ces matieres ſont un ſeul & meme ſel, & nous les conſidererons comme telles.

Chymie Experimentale & Raiſoneè, par Mr. Baumé, Tom. I. p. 154.

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in England, is better known by the name of Derbyſhire Spar. All the bodies belonging to this claſs have lately been ſhewn to conſiſt of a calcareous earth, and an acid of a very peculiar nature, which has the property of corroding glaſs, and of converting water into flint. Flint, therefore, is probably not a ſimple earth, as philoſophers have generally ſuppoſed, but a compound ſubſtance, conſiſting of water, and this lately diſcovered acid.

The vitrifiable, or flinty earths, bear, nevertheleſs, ſtronger marks of a ſimple ſubſtance, than any body hitherto known; and we are now certain, that it forms the baſis of rock cryſtals,* and a part of the whole tribe of precious ſtones, except the diamond. All theſe ſtones have evidently been formed by the cryſtallization of the matters which enter into their compoſition; and all the phenomena relating to their figure,

* Il ſeroit d'ailleurs difficile de pénetrer aſſez profondement dans le intérieur du globe pour recueiller de la terre primitive, & qui n'auroit eprouvé aucune alteration. Il paroît certain, que ſi l'on pouvoit ſe procurer de cette eſpece de terre, & un degré de feu ſuffiſant pour la faire entrer en fuſion, on la reduiroit en une maſſe auſſi belle que le beau cryſtal de roche, & qu'on ne pourroit diſtinguer l'un de l'autre.

Chymie Experimentale & Raiſonnée, par Mr. Baumé, Tom. I. p. 104.

tranſparency, &c. bear a ſtrong analogy to thoſe of the ſaline cryſtals already deſcribed.

Each ſaline ſubſtance, of which there is a great variety, ſhoots, as already obſerved, into cryſtals of a figure and degree of tranſparency peculiar to itſelf: and the ſame thing is true, in general, with regard to gems or precious ſtones. Thus, the diamond is naturally of one form, the ruby of another, the ſapphire of a third, &c. and each of them poſſeſſes a degree of tranſparency different from all the reſt.

Among philoſophers it has long been a queſtion, from what ſtate the precious ſtones have cryſtallized? that is, whether their particles were originally ſuſpended in water, or reduced to a fluid ſtate by the action of a very intenſe heat? Each of theſe opinions has been eſpouſed by men of the firſt abilities and reputation, and ſeveral arguments have been urged on both ſides of the queſtion.

From analogy, and ſeveral facts, which will afterwards appear, there is room, I am perſuaded, to conjecture, that all precious ſtones, with many other mineral bodies, have been originally in a ſtate of fuſion, by means of heat, from which they have been formed by the law of cryſtallization.

Pure vitrifiable earth, indeed, cannot be brought into fuſion by the heat of our furnaces; but black flint has been melted without addi-

tion

tion by the concentrated rays of the ſun; and, perhaps, there are, or have been, degrees of heat in nature, ſufficient to produce the ſame effect. Is it not poſſible, that thoſe immenſe fires, which ſeem to be the cauſe of earthquakes and burning mountains, are ſufficiently ſtrong to bring into fuſion the pureſt kind of vitrifiable earth? Is it not probable, that from fuſions thus effected the whole tribe of precious ſtones have been formed by cryſtallization?*

If this conjecture has any foundation in nature, it will enable us to account in a very ſatisfactory manner for all the peculiar properties obſervable in this claſs of bodies. If the melted matter, in which the vitrifiable earth is diffuſed, be ſufficiently fluid, and if the cryſtallization be carried on with due regularity, the cryſtals will be well formed, and will exclude from their compoſition all heterogeneous matters. If, however, the melted matter be too tenacious, or, if the proceſs be carried on with too much rapidity, the cryſtals will be irregular, and involve in their compoſition more or leſs heterogeneous matters, according to

* The difficulty of accounting for the fuſion of the earth, conſtituting the precious ſtones, is obviated by the experiments of the celebrated Bergman, whoſe analyſis of theſe ſubſtances had not been ſeen by the author, at the time of writing this paper. For, from theſe it appears, that the gems contain not only vitrifiable, but argillaceous and calcareous earth.

circumſtances, which need not be mentioned. * Thus, for inſtance, an admixture of metals may give to the cryſtal different colours, ſuch as the ruby, the emerald, the topaz, or the amethyſt; † and, when the cryſtal is perfectly pure, it conſtitutes the colourleſs rock cryſtal.

Is not this hypotheſis ſtrongly ſupported by the diſſipation of the colours of the precious ſtones? And is not the reſtoration of thoſe colours a ſtriking proof, that this hypotheſis is founded in nature?

Three principles, at leaſt, ſeem to enter into the compoſition of precious ſtones, viz. vitrifiable earth, the metallic calces on which their colours depend, and the particular matter determining the figure into which they cryſtallize; the variety of which might be inſtanced by ſeveral examples. The preſence of the principle juſt mentioned is ſtill further indicated by the different degree of hardneſs obſervable in precious ſtones. The rock cryſtal, although as colourleſs and tranſparent as the pureſt diamond, is, nevertheleſs, the

* When cryſtals are found irregular and not pure, the vulgar expreſſion is, that they are not ripe; but the truth is, they never could ripen, though left to the end of time, on account of ſome heterogeneous matters having entered into their compoſition.

† Bergman has ſhewn that all theſe colours may be imparted to gems by iron only.

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ſofteſt of the whole claſs to which it belongs.* Had theſe facts been ſufficiently attended to, the component parts of precious ſtones had probably been better underſtood, and the different figures of theſe ſubſtances might have been ſhewn to have proceeded from one conſtant and permanent law of cryſtallization.

But, be this as it may, the principles already in our poſſeſſion are ſufficient to ſupport a rational theory, not only of the formation of precious ſtones, but alſo of thoſe ſubſtances known by the name of pebbles. Many ſubſtances which, under proper circumſtances, ſhoot into cryſtals of the moſt regular form, concrete into diſorderly maſſes, when the proceſs is carried on with too much precipitation. Have we not reaſon therefore to conjecture, that pebbles, agates, and even common flint are the products of ſome ſuch irregular cryſtallization? This may be exemplified in the pebbles found among the rocks of Arthur's ſeat near Edinburgh, which are a vitrifiable matter, mixed with different heterogeneous ſubſtances, from which a variety of colours and irregular ſhapes is produced; and the rocks,

* The topaz ſeems to be an exact rock cryſtal with a yellow colour, probably from the calx of ſome metal; it is a priſm of ſix irregular ſides. I have ſeen ſome of them of a very large ſize; many are found in the mountains of Scotland, and, ſometimes, at the foot of mountains, buried in the earth, having been waſhed down by the rains.

where the pebbles are found, ſeem to have derived their origin from lava or volcanic matter.*

That the effects of volcanos are more extenſive than philoſophers, till of late, have been aware of, will, I am perſuaded, be readily acknowledged; and by the help of many obſervations lately made, we are enabled to account for various phenomena, which otherwiſe, muſt have remained for ever unintelligible to the human ſpecies. Of theſe, however, we ſhall only take notice of thoſe columnar pillars called Baſaltes, or Giant's cauſeways. If we carefully attend to all the phenomena, obſervable in theſe productions of nature, we ſhall find reaſon to conclude, that they are nothing more than cryſtallizations of lava or matter, brought into a ſtate of fuſion by the heat of ſubterraneous fires.

If ever it could be ſaid, that nature ſeemed to imitate art, it is in the formation of the Giant's cauſeways in the north of Ireland, where every pillar appears to have been hewn by an artiſt, and placed ſo cloſe to each other, as ſcarce to admit a pin betwixt them. Their general figures are pentagons, hexagons and heptagons. Pillars with more ſides are to be met with; their ſides, however, are by no means equal. Each pillar, according to its number of ſides, muſt be ſurrounded

* Quere, what is the reaſon why flint is generally found among chalk or calcareous earths?

by

by a like number of pillars, which differ from each other both in ſhape and in ſize, as not any two of them have been found alike in every reſpect. Theſe pillars are moreover divided into joints, at unequal diſtances, which, by the aſſiſtance of a crow of iron, may be forced aſunder; and, what is very remarkable, a pillar, ſeparated at thoſe joints, always ſhews one end convex, and the other concave; the convexity being ſometimes turned from, and ſometimes towards the horizon; but, in any ſingle pillar, the direction is always the ſame.

Have we not every reaſon to conclude, that the iſland of Staffa, and the Giant's cauſeways have been productions of volcanic matter, made liquid by ſome ſubterraneous fire, and, as ſoon as it cooled by ſlow degrees, cryſtallized into that form which they now exhibit? Had the ſeparation of theſe pillars been owing to accident, they would have appeared like cracks in the earth, formed during a very dry ſeaſon, without order, beauty or regularity; whereas the reverſe is very conſpicuous.

By attending to the facts and obſervations already related, it will, I am perſuaded, appear, that the ſetting of metals is, in reality, a ſpecies of cryſtallization. This idea is ſtrongly confirmed, by the laminated texture which all the ſemimetals diſcover, when broken in any direction. The needle-like cryſtals, ſo conſpicuous

in crude antimony, clearly ſhew, that this ſubſtance, during its formation, has been acted upon by ſome cauſe, either the ſame, or ſome other, very analogous to that, by which the precious ſtones, baſaltes, &c. are made to cryſtallize.* The ſame thing is true with reſpect to biſmuth; and even pure ſilver, during its paſſage from a fluid to a ſolid ſtate, diſcovers a tendency to form on its ſurface a number of ſtriæ, which no doubt proceed from a diſpoſition of the metal to cryſtallize, or arrange its particles in a particular order.

The expanſion of water, during its freezing, is now univerſally allowed to be occaſioned by the cryſtallization of its parts. And, to me, it ſeems probable, that the expanſion of biſmuth and iron, in ſimilar circumſtances, proceeds from the ſame cauſe.†

Lead ore, when tolerably pure, is generally found in maſſes of a cubic form; though, ſometimes, in ſhape of priſms. Perhaps this variety is

* I obſerved at Warrington (where copper ore is ſmelted) the droſs and flux which ſwim on the top of the metal in the furnace in a liquid ſtate, are caſt into moulds in ſhape of a double cube; theſe maſſes, when cold, very much reſemble lava or volcanic matter, and, when broken, evidently ſhew a cryſtalline appearance in many parts, eſpecially about the corners.

† Figures caſt from melted iron are always very ſharp, becauſe that metal expands as it cools, by which means the whole dye or mould is completely filled.

owing

owing to the proportion of ſilver contained in the ores.

Some writers affirm, that native gold has been found in a cryſtallized ſtate, and the form it aſſumes is that of a priſm of eight ſides.

With theſe obſervations I ſhall conclude this paper, which has been extended to an unreaſonable length, for which, I hope, the importance of the ſubject will plead my excuſe.

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*On the* PRESERVATION *of* SEA WATER *from* PUTREFACTION *by Means of* QUICKLIME. *By* THOMAS HENRY, F. R. S. *to which is added, an Account of a newly invented Machine for* IMPREGNATING WATER *or other* FLUIDS *with* FIXED AIR, *&c. communicated to Mr.* HENRY *by* I. HAYGARTH, M. B. F. R. S. *Read November* 21, 1781.

IT has been frequently remarked by chemical and philoſophical writers, that a new experiment is ſeldom made in vain. Though the operator may even fail of attaining the immediate object of his purſuit, he may yet, fortuitouſly, acquire the knowledge of ſome new fact, which may be productive of improvemant and advantage to ſcience.

About

About the time I publiſhed my method of preſerving water, at ſea, from putrefaction, &c.* a Gentleman, who had obtained a quantity of ſea water, for the purpoſe of bathing a child, complained to me that it ſoon became putrid, and requeſted that I would think of ſome expedient to preſerve it.

The principal ſalts contained in ſea water are, 1ſt. common marine or culinary ſalt, compounded of foſſil alkali and marine acid; 2dly. a ſalt formed by the union of the ſame acid with magneſian earth; and laſtly, a ſmall quantity of ſelenite. The quantity of ſaline matter contained in a pint of ſea water, in the Britiſh ſeas, is according to Neuman, about one ounce in each pint.† When this water is ſlowly evaporated, the common ſalt firſt cryſtallizes, and the marine magneſian ſalt is left in, what is called, the bittern, from which,

* An account of a method of preſerving water, at ſea, from putrefaction, and of reſtoring to the water its original purity and pleaſantneſs, by a cheap and eaſy proceſs, &c. London, 1781.

† In Sir Torbern Bergman's analyſis of ſea water taken up, in the beginning of June 1776, about the latitude of the Canaries, from the depth of ſixty fathoms, the ſolid contents of a pint of the water were

| | Grs. | | ℥ | ℈ | Grs. |
|---|---|---|---|---|---|
| Of common ſalt | $253\frac{6}{11}$ | | | | |
| Salited magneſia | $69\frac{1}{11}$ | or | 5 | 1 | $10\frac{9}{11}$ |
| Gypſum | $8\frac{2}{11}$ | | | | |
| Total | $330\frac{9}{11}$ | | | | |

by

by a ſubſequent proceſs, the purging bitter ſalt, commonly named Epſom ſalt, is obtained. By this ſeparation, the ſea or bay ſalt is rendered much better adapted for the preſervation of animal ſubſtances, than the ſalt of the rocks and ſprings in Cheſhire and Worceſterſhire, where, from what I apprehend, to be a miſtaken notion, that this bittern does not exiſt in the brine, the liquor is ſo haſtily evaporated, that the cryſtals of common ſalt retain much of the magneſian ſalt among them. For the magneſian ſalt is highly ſeptic, and greatly impairs the properties of the other.*

The two methods which occurred to me, as likely to anſwer the wiſhes of my friend, were, 1ſt. the addition of quicklime, and 2dly, that of common ſalt. To the trial of the former I was induced by its known antiſeptic effects on common water; and, it is aſcertained, that a ſmall portion of common ſalt promotes, whereas a larger retards, putrefaction.

EXPERIMENT I.

To one quart of ſea water were added two ſcruples of freſh quicklime; to another, half an

* At ſome of the works at Northwich, the evaporation is carried on, in ſo gentle a manner, that large cubical cryſtals are formed; and the ſalt thus prepared is ſaid to be equal in ſtrength to bay ſalt.

ounce

ounce of common culinary ſalt; and a third was kept as a ſtandard, without any addition. The mouths of the bottles being looſely covered with paper, they were expoſed to the action of the ſun, in ſome of the hotteſt weather of the laſt ſummer.

In about a week, the ſtandard became very offenſive; and the water, with the additional quantity of ſalt, did not continue ſweet many hours longer; whereas, that with lime, continued many months, without ever exhibiting the leaſt marks of putridity.

It ſeemed probable, that all, or ſome, of three changes had been effected by this proceſs. It was ſuſpected, that quicklime might decompoſe the marine ſalt, with alkaline baſis; a power which it has lately been ſuppoſed to poſſeſs, under certain circumſtances: or that its antiſeptic powers might depend on the formation of a lime water; by either of which, a material, and, perhaps, unfavourable, alteration might be produced: or laſtly, that the precipitation of the earthy baſis of the magneſian ſalt, by the quicklime, might contribute to the preſervation of the ſea water.

## EXPERIMENTS II. & III.

On ſubmitting the water to which the lime had been added, to the common trials for detecting a diſengaged alkali, no ſigns of ſuch a ſalt were diſcovered. And upon blowing into it a long

continued

continued ſtream of air from the lungs, no precipitation nor cloudineſs enſued, as in the caſe of lime water.

It remained to ſee, whether the precipitation of the magneſian earth, from its acid, had been effected. Under ſome circumſtances, it has been proved, by the very ingenious Dr. Black, that magneſia will precipitate calcareous earth from acids. As, for inſtance, if mild magneſia be thrown into a ſolution of calcareous earth, in marine or nitrous acid, the calcareous earth will be precipitated; the ſum of the attraction between this earth and fixed air, and between the magneſia and the acid, being greater than thoſe which ſubſiſted between the magneſia and the air, and between the calcareous earth and the acid. But, if cauſtic calcareous earth be added to a ſolution of magneſia in thoſe acids, its affinity to the acid is, in this ſtate, increaſed, no fixed air attracts it, and it precipitates the magneſia.

## EXPERIMENT IV.

To ſome of the ſea water, which had been kept as a ſtandard, ſome lime water was added, and a turbidneſs immediately took place, ſucceeded by a copious precipitation. This, at firſt, convinced an ingenious Member of this Society, Dr. Eaſon, who happened to be preſent, and myſelf, that we had diſcovered the manner in which the

the lime acted, and the reaſon why no lime water was produced. But, on adding lime water alſo to ſome of the ſea water which had been preſerved by the lime, a cloudineſs and precipitation reſembling the former took place, and ſtaggered us in our theory; for we imagined, that the portion of quicklime had been ſufficient to have precipitated the whole of the magneſia which the water might have contained, and we now ſuſpected, that the ſolution of the lime, was, therefore, probably prevented by the ſea ſalt.

Other avocations prevented my purſuing the inquiry at that time, but I have ſince reſumed it, and been able to elucidate the whole matter.

## EXPERIMENT V.

Into a ſtrong ſolution of the common Cheſhire ſalt, ſome lime water was poured. The mixture became turbid, and a white earth was ſeparated, which did not ſink to the bottom of the glaſs, but was ſuſpended, partly, on the ſurface, and, partly, in the midſt of the liquor.

But from whence did this precipitate proceed? Was it the lime thrown down by the ſalt; or did the lime ſeparate ſomething from the common ſalt?

## EXPERIMENT VI.

To a portion of the ſame ſolution, inſtead of lime water, ſome drops of a ſolution of foſſil alkali

alkali were added, and the ſame appearances occurred.

EXPERIMENT VII.

Each of theſe precipitates were rapidly and wholly diſſolved, the greateſt part of the water being firſt poured off, on the addition of a few drops of dilute vitriolic acid. A proof that the precipitated earth was magneſia.

EXPERIMENT VIII.

To determine whether the addition of a portion of bitter purging ſalt, to a ſolution of common ſalt, would prevent the forming of lime water, with an equal quantity of lime to that which had preſerved the ſea water, I mixed twenty grains of quicklime, ſeven drachms of common ſalt, and one drachm of bitter purging ſalt with a pint of rain water; but no lime water was produced. Whereas, a lime water was formed, by an equal quantity of lime with a pint of rain water, and alſo with a ſolution of common ſalt, from which the earthy matter it contained had been previouſly precipitated by foſſil alkali, and the alkali neutraliſed by marine acid.

The next queſtion that preſented itſelf to my inveſtigation, was, whether the common Cheſhire ſalt was ſo impregnated with magneſian ſalt, as to prevent the forming lime water, with a like quantity of lime, when uſed in the proportion of an ounce of ſalt to a pint of water.

EXPE-

EXPERIMENT IX.

Theſe proportions of Cheſhire ſalt, quicklime, and rain water, being mixed, and ſuffered to ſtand a ſufficient time, the filtered liquor exhibited no ſigns of being impregnated with unneutraliſed lime: but, on adding a few drops of lixivium tartari, it inſtantly became very turbid, and depoſited a ſediment, which, inſtead of diſappearing on the addition of vitriolic acid, formed a ſelenite with it, and again ſettled at the bottom of the glaſs.

EXPERIMENT X.

Five grains of quicklime, being added to the mixture of the ninth experiment, and the liquor, after due time, being filtered, and ſubjected to the uſual teſt, exhibited evident marks of having become a lime water.

I now began to ſuſpect, that the portion of quicklime, added to the ſea water, in the firſt experiment, had not been ſufficient to precipitate the whole of the magneſia from its acid, and having ſome of the mixture of that experiment ſtill by me, I again turned my attention to it.

EXPERIMENT XI.

The remaining part of the ſea water, to which the quicklime had been added, was about a pint and half. Lime water, being added to a ſmall

part

part of it, the ſame turbid appearance took place as formerly.

EXPERIMENT XII.

On the addition of another drachm of lime, the water, when filtered, no longer became turbid, on the mixture of lime water to it; but it did not yet exhibit any ſigns of being itſelf a lime water. But,

EXPERIMENT XIII.

When I added another drachm of lime, a lime water was formed. For the water now became very turbid, on blowing air into it from the lungs.

Theſe experiments, therefore, not only prove that ſea water may be preſerved for the purpoſes of bathing, by means of quicklime, without forming a lime water, but they point out the rationale of this phenomenon; and alſo inſtruct us what portion of lime may be uſed, without a lime water being produced.

It appears that quicklime, diſſolved in water, precipitates the magneſian earth from the marine acid, with which it is united in the ſea water, and, uniting with that acid, is retained in the water, under the form of a marine ſelenite. What the water loſes, therefore, of one ſalt, it gains of another. At the ſame time, the magneſia, being precipitated by a *cauſtic* calcareous earth, falls in a ſtate ſimilar to that

to which it is reduced by calcination, viz. void of fixed air. In this ſtate, I have formerly proved, by a train of experiments, that it is ſtrongly antiſeptic. * Being inſoluble, the water is preſerved without forming any combination with it; and the only alteration that is made in the component parts of the ſea water, is, that the earthy marine ſalt changes its baſis of magneſia for one that is calcareous.

We alſo ſee, that there are limits to the addition of quicklime, beyond which, we cannot proceed, without forming lime water. The quantity of two ſcruples, to a quart of ſea water, though not ſufficient to decompoſe the whole of the magneſian ſalt, was yet adequate to the preſervation of the water. One drachm more of quicklime ſeparated the whole of the magneſia, and, when a further addition was made, a lime water was immediately formed. †

The properties of common ſalt, as an antiſeptic, are greatly weakened by the portion of marine

* From theſe experiments it appeared, that magneſia alba, while poſſeſſed of its fixed air, is highly ſeptic to animal fleſh, but antiſeptic to bile; whereas, when calcined, and deprived of its fixed air, it is ſtrongly antiſeptic both to fleſh and bile.

See Henry's Experiments and Obſervations, p. 58. & ſeq.

† Theſe proportions may vary, according to the ſtrength of the quicklime employed.

magneſian

magneſian ſalt, mixed with it. It is probable, that the marine ſelenite may be leſs ſeptic, and leſs ſoluble in water, ſo as to ſeparate, during the evaporation of the brine. If ſo, the addition of quicklime may be uſeful, previous to that proceſs at the ſalt works. But we are ſo little acquainted with the properties of calcareous ſalts, that, at preſent, we cannot determine what might be the effects of ſuch a practice. I propoſe, however, at ſome future opportunity, to try, whether the calcareous marine ſalt will thus ſeparate; and whether it be, in itſelf, ſeptic, or antiſeptic.

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Dr. Haygarth, of Cheſter, who is not more diſtinguiſhed for his extenſive knowledge, than for his friendly and benevolent diſpoſition, has lately, in the moſt obliging manner, communicated to me, a deſcription of an apparatus, which he has invented to mix air with liquids. The Doctor apprehended, that this method might facilitate my deſign of precipitating the lime from water, to which it might have been added on ſhip board; and, with his uſual candour, and generoſity, delivered up his invention to my ſervice. The plan is truly ingenious, but I fear, and all my friends, whom I have conſulted, agree with me in the apprehenſion, that the machine would be much too complex to admit of being

uſed at ſea. It is capable, however, of being applied to ſo many uſeful purpoſes, that, I truſt, the Society will think the communication of this valuable improvement well worthy of their attention.

*Deſcription of an Apparatus to mix Air with Liquids.*

In the figure, plate 1. an effervеſcing veſſel is repreſented (at E) in which fixed air is detached from a mixture of calcareous earth, and vitriolic acid, conveyed through the tubes (T *t*) into the air veſſel (A). The fixed air, being of greater ſpecific gravity, will fall to the bottom, and expel the common air at the top through the orifice (at O). It may be known when the veſſel is full of fixed air, by ſmelling; or extinguiſhing a candle at this orifice; or by computing the quantity of vitriolic acid and calcareous earth that will generate a certain quantity of air. A pair of common bellows (at B) with a pipe, a few inches longer than uſual and bent, is placed with the vent ſo as to receive the air pipe (P), and the bellows pipe at (*b*) is inſerted into the top of the water veſſel (W). The bellows being worked, the fixed air riſes, from the bottom of the air veſſel, through the pipe (P P) into the vacuum within the bellows, and is impelled, with force, through the bellows pipe (*b*) into the body of the water veſſel, filled with lime water, or any other kind of liquid. The air, which is not abſorbed by the liquid, riſes to the ſurface in bubbles

bubbles occaſioning conſiderable agitation; and returns into the air veſſel through the communication (CC.) That portion of fixed air, which is incapable of abſorption by lime water, &c. being ſpecifically lighter than the reſt, will eſcape through the orifice (at O) as the fixed air is ſupplied by the effervescing mixture, but the pure fixed air, thus returned into the air veſſel, is again inhaled by the bellows, and blown into the lime water. The air and water veſſels, in the model I have had made, are of tin, containing about four gallons a-piece. The orifices (at T, *t*, B, *b*,) are made air-tight, with perforated corks. The tubes (P, *p* and *t*) run down the ſides of the air veſſels. The tube *(b)* which is a continuation of the bellows pipe, runs down the middle of the water veſſel. This pipe might be immerſed twelve or thirteen inches into the body of the water, as I have found, that a pair of common bellows, will force air through water, to this depth, with moderate exertion.

In my model, the bellows, contrary to my direction, are of a large ſize, and there was difficulty in working them, as might be expected, when all the orifices are ſhut. To obviate this inconvenience, I tied a bladder, full of fixed air, upon the orifice (at O) and opening into the air, veſſel. By this device, the bellows work with as much eaſe as in the open air; and the bladder fills and empties exactly like the lungs in reſpira-

tion. The tube P, *p* ſhould be of the ſame diameter as the vent of the bellows, and the communication (CC) ſhould not be of a leſs ſize, otherwiſe the water will riſe into the bellows when they are worked.

After this deſcription, it would be ſuperfluous to explain, that, in this proceſs, there would be no loſs of fixed air or of time; or to obſerve, that from the known attraction between fixed air and quicklime, a ſufficient quantity of lime water might be freed from lime in a ſhort time, ſo as to ſupply a ſhip's company with little trouble or expence.

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*On the Nature and eſſential Characters of* POETRY, *as diſtinguiſhed from* PROSE. *By* THOMAS BARNES, D.D. *Read December* 5, 1781.

TO ſettle with preciſion the limits which divide *poetic* from *proſaic* compoſition, may perhaps appear, at firſt ſight, to be neither very difficult, nor very intereſting. As, however, one great object of this ſociety is, the enjoyment of free and friendly converſation upon ſubjects connected with ſcience, it is probable, that topics, which are not in themſelves of the greateſt importance, may ſometimes open a wider field, than others of more intrinſic excellence. Where much

much may be ſaid in ſupport of different hypotheſes, we may hope for that colliſion of friendly argument, which may ſtrike out ſome ſparks, both of amuſement and information. Thus, a comparatively trifling ſubject may eventually contribute to the nobleſt uſes, to the exerciſe of the mental faculties, and to the diffuſion of candour, and intelligence. Our time will not be quite miſpent, if we can only glean from the topic before us, a ſingle hour's agreeable and literary entertainment.

"Wherein conſiſts the *eſſence* of POETRY," is a queſtion, which it will not be ſo eaſy to anſwer, as may at firſt be imagined. Different authors have given very different definitions. Some have denominated it, "The art of expreſſing our thoughts by fiction." Others have imagined its eſſence to lie, in "The power of imitation:"—and others again, in "The art of giving pleaſure." But it is evident, that *fiction*, *imitation*, and *pleaſure*, are not the properties of poetry *alone*. Proſaic compoſition may contain the moſt ingenious *fables*. It may preſent the moſt ſtriking *reſemblances*. It may inſpire the moſt ſenſible *delight*.

Poetry has been generally denominated an ART. HORACE, if he himſelf gave the title to his own celebrated and admirable poem, has characterized it under that name. The *term* itſelf (Ποιησις) would naturally lead to the ſame

idea; for it ſeems to imply, that labour and ingenuity, the neceſſary companions of *art*, muſt be employed in poetic compoſition. But certainly, it has the neareſt affinity to *ſcience* of any other art; for all its excellence conſiſts, in its preſenting ſcience in a peculiar and engaging dreſs. An *art*, by which ſcience is aſſiſted, and ſentiment exalted; by which the imagination is elevated, the heart delighted, and the nobleſt paſſions of the human ſoul expreſſed, improved, and heightened, will appear important enough, to have its boundaries exactly drawn, and the limits aſcertained, which divide it from its humble neighbour. Or, if this be not poſſible, to have its *general* and *larger* characteriſtics clearly repreſented.

What is it, then, which conſtitutes the poetic eſſence, and diſtinguiſhes it from proſe? Is it METRE?—Or is it ſomething entirely different; ſublimity of SENTIMENT, boldneſs of FIGURE, grandeur of DESCRIPTION, or embelliſhment of IMAGINATION? Let us attend to the arguments, which may be offered on behalf of both theſe hypotheſes.

"*The characteriſtic nature of poetry*, it may be ſaid, *conſiſts in* ELEVATION OF THOUGHT, *in* IMAGERY, in ORNAMENT."

"For, have there not been real poems formed, without the ſhackle of regular verſe? Poems, which none, but a faſtidious critic, would ſcruple a moment

a moment to honour with that name? Is not TELEMACHUS a noble epic poem? For who would dare to degrade it to a lower character? Who would refuſe the appellation to, the *Death of* ABEL, which thoſe, who underſtand the German language, ſpeak of with ſo much rapture? Or to the *Incas* of MARMONTEL, which the French celebrate, with equal enthuſiaſm of praiſe!

"Does not elevation of ſentiment of itſelf produce *modulation* of language? The ſoul, inſpired with great ideas, naturally treads with a lofty ſtep. There is a dignity in all her movements. She declaims, with a meaſured, ſolemn, majeſtic utterance. Her ſtile is ſonorous, and ſwelling. Theſe attributes indicate; theſe *conſtitute* the poet. They give ſtrength and feeling to his compoſitions. Where *theſe* are found, who would look for any *higher* claims, before he would confer the palm of poetic honours? Where theſe are *wanting*, what *other* properties could give, even the ſhadow of a title? Who would refuſe the title of BARD to the great Maſter of *Hebrew ſong?* For what can be more truly ſublime, or poetical, than many of the *Pſalms* of DAVID? And yet, after the ingenious labours of the learned Dr. LOWTH, the *metre* or *rhythm* has not been exactly aſcertained; and probably will not, becauſe it does not exiſt. The harmony of numbers, of which every ear muſt be ſenſible, ariſes purely from the *native impulſe* of a

ſoul,

ſoul, inſpired with ſentiments, which it could not poſſibly expreſs in any language, but what was fervid and poetical.

" By this theory, it may be ſaid, we account for the common remark, that the *original* language of mankind was poetical: becauſe, in the infancy of the world, every thing would naturally excite admiration, and vehement paſſion. Their rude and imperfect ſpeech would bear inſcribed upon it, the ſtamp of ſtrong and animated feeling. It would reſemble the harangues of Indian orators, at this day, whoſe ſpeeches are accompanied with tones and geſtures, which to a cultivated European, appear extravagantly pompous. Their lives were full of danger and variety. New ſcenes were continually opening upon them. Growing arts and ſciences were preſenting new objects of curioſity. Hence, their *feelings* were amazingly intenſe. And hence their language was bold, and poetically ſublime. Longinus, in the fragment of a treatiſe, which is unhappily loſt, has this ſentiment. " Meaſure belongs properly to poetry, as it perſonates the paſſions, and their language; it uſes fiction and fable, which *naturally produce* numbers and harmony."

It may be added, in ſupport of this definition, " That our own inimitable poet, than whom none ſeems more to have enjoyed the inſpiration of the Muſe, deſcribes the poet, as chiefly diſtinguiſhed by the fervour of Imagination. He does not, indeed,

indeed, aſſign him the moſt honourable company; but he makes ample amends, by a deſcription of poetic fancy, wonderfully brilliant and captivating.

"The LUNATIC, the LOVER, and the POET,
Are of *imagination* all compact.
One ſees more devils than vaſt hell can hold,
That is the MADMAN: the LOVER, all as frantic,
Sees Helen's beauty on a brow of Egypt:
The POET's *eye*, in a fine frenzy rolling,
Doth glance from heaven to earth, from earth to heaven;
And, as imagination bodies forth
The forms of things unknown, the poet's *pen*
Turns them to ſhapes, and gives to airy nothing
A local habitation and a name." SHAKESPEARE.

Who can forbear applying to the *poet*, what has been ſo juſtly applied to the great *critic*, lately quoted,

"He is HIMSELF the GREAT SUBLIME he draws!"

"HORACE, likewiſe, ſeems to rank himſelf on this ſide of the queſtion in the fourth Satire of his firſt book, where he endeavours to ſettle the point of Poetic Character. He, firſt, excepts himſelf from the number of thoſe, to whom he would allow the name of *Poet*; becauſe compoſitions like his own, "*ſermoni propiora*," do not give a juſt claim to the appellation. He, then, deſcribes the REAL BARD;

INGENIUM cui ſit; cui MENS DIVINOR, atque os
MAGNA SONATURUM, des nominis hujus honorem.

With

With reſpect to himſelf, and to Lucilius, he tells us, that if you take away the *order* and the *meaſure*, their verſes would become "ſermo merus," *mere proſe*. Not ſo, if you take in pieces that line of Ennius,

"Poſtquam diſcordia tetra
Belli ferratos poſtes, portaſque refregit."

For then, he exclaims,

"Invenias etiam DISJECTI membra POETÆ!"

The true poetic eſſence, then conſiſts in ELEVATION, IMAGERY, and GRANDEUR; to which *modulation* is no more than an adjunct; neceſſary indeed, becauſe it, in ſome degree, neceſſarily accompanies animated and poetic *ſentiment*."

To theſe arguments, it may be replied:

"That the modeſty of HORACE, in excepting himſelf from the rank and honours of poetic character, will not be admitted, even with reſpect to thoſe verſes, as to which *alone*, he made the exception. For, who has not in every age claſſed the *Epiſtles* and *Satires* of HORACE, in the number of *poetic compoſitions*, though, as he ſays, his ſtile only

"Pede certo
Differt ſermoni: ſermo merus."

"If we adhere rigorouſly to this definition, ſhall we not exclude *many* candidates, from whom we ſhould be ſorry to pluck the well-earned wreath of poetic fame? All verſes, where the ſubject is *low* or *ridiculous*, as the HUDIBRAS OF BUTLER;

BUTLER; where it is *ſimple* and *narrative*, as the FABLES OF GAY; or even, where it is *plaintive* and *melancholy*, as the CHURCH YARD OF GRAY, muſt be baniſhed from the region of the Muſe. Parnaſſus muſt be, 'ALL CLIFF,' without a ſingle *vale* in all its circuit. None muſt then be deemed a POET, who cannot ſoar to its loftieſt ſummit, on *Epic*, or *Heroic* wing. If we ſhould form an *index expurgatorius* upon this principle, what havock ſhould we make among the *minor poets?* How many ſhould we exclude, whom every lover of the Muſe ranks, with grateful veneration, in the number of her inſpired votaries?

"Elevation of ſentiment, imagery, and creative fancy, are not to be found in poetry alone. They often belong as much to the *Orator*. For where will you find nobler flights of imagination, loftier ſentiments, bolder addreſſes to the paſſions, or more animated, we might ſay, *modulated* language, than in the *Orations* of CICERO; not to mention thoſe of our modern orators, whoſe eloquence, however, we would not ſcruple to compare with that of the moſt admired antients?

"If we might argue from the *name*, POETRY, we ſhould naturally conclude, that the antients themſelves underſtood by the term, not thoſe *irregular* modulations, which *naturally* aroſe from the impulſe of ſtrong and impaſſioned feelings, from grandeur of ſentiment, from beauty, or boldneſs of imagery; but, ſomething more

*artificial*

*artificial* and *elaborate*; ſomething, which demanded more effort and ingenuity to *form*, than merely aroſe from the effuſions of a glowing heart?

"Is not, then, the proper and peculiar characteriſtic of poetry, that METRE or RHYTHM, which the ear ſo eaſily diſtinguiſhes, and with which it is ſo unſpeakably delighted? Is not this the *great diſtinction* between the modulation of poetry and proſe; that the one, is *regular*, determined by certain *laws*, and returning upon the ear at ſtated *periods*; whilſt the other, has no ſtandard but the *general ſenſe* of harmony, and is infinitely *irregular* and *various?* The imagery or ſentiment is a mere *circumſtance*, which does not *conſtitute*, however it may *adorn*, poetic compoſition. We can ſuppoſe nonſenſe in proſe. Can we not equally ſuppoſe nonſenſe in poetry? And yet, ſhall there not be an *eſſential difference*, between poetic and proſaic jargon? If ſo, ſomething elſe, beſides the *ſentiment* or *ſenſe*, is the boundary between them. And what is this, but that METRE or MELODY, without which, the language which conveys the loftieſt ſentiments may be indeed *poetical*, but can never be, POETRY ITSELF."

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I ſhall not pretend to decide, abſolutely, upon the ſtrength or weakneſs of the foregoing arguments. I ſhall be happy to hear them fully diſcuſſed

diſcuſſed in the enſuing converſation, from which I promiſe myſelf, both inſtruction and entertainment.

At preſent, I find myſelf diſpoſed to reſt in ſome ſuch general concluſion, as the following.

To FINISHED AND PERFECT POETRY, or rather to the HIGHEST ORDER of poetic compoſitions, are neceſſary, elevation of *ſentiment*, fire of *imagination*, and regularity of *metre*. This is the *ſummit* of PARNASSUS. But, from this ſublimeſt point, there are gradual declinations, till you come to the region of proſe. The *laſt line* of ſeparation is, that of *regular metre*. And, in common language, not having ſettled with preciſion the nature or boundaries of either, we often apply the poetic character with great latitude, to compoſitions, which have more or leſs of the preceding qualities, but which are formed into uniform and regular *verſe*. Often, the name is given to works, which have nothing to diſtinguiſh them, but *mere number*. What *has not* this metrical modulation, we call *poetical*; and what *has* it, we call *proſaic*, ſolely upon account of the *ſentiment*. For poetry and proſe, like two colours, eaſily diſtinguiſhable from each other in their pure, unmixed ſtate, melt into one another by almoſt imperceptible ſhades, till the diſtinction is entirely loſt. Their *general characters* are widely different. Their *approximations* admit of the neareſt reſemblances.

With

With reſpect to *mere number*, the difficulty is not great, in the preſent cultivated ſtate of language, for any perſon, of a tolerable ear, to tag together lines, the muſic of which ſhall be flowing and agreeable. Hence, the multitudes of *indifferent poets*, who abound amongſt us! But it has been juſtly obſerved, that a ſtate of cultivated ſociety is not favourable to thoſe bolder exertions of poetic fancy, which elevate, aſtoniſh, and delight the mind.

It has been often ſaid, as we have before remarked, that the *original* ſtile, both of hiſtory and converſation, was poetical. The friends of this hypotheſis muſt mean no more, than that, in early ages, their language was, in general, bold and florid. And we have already obſerved, that ſtrong conceptions naturally clothe themſelves in figurative, and modulated expreſſions. From *ſtrong*, to *regular*, the tranſition is not difficult; and the advantage would be great. Uniform metre would give more delight to the *ear*, by rendering the muſic more perfect; and it would be more eaſily retained by the *memory*.

We may account for the formation of *regular verſe*, on another principle. This ſame animated feeling, which prompted men to *dance* and *ſing*, would alſo prompt them, to expreſs themſelves with energy of *tone*, of *ſtile*, of *ſentiment*. It would lead them to endeavour to adapt their *language* to their *ſong*. But, in order to this union, it muſt

muſt become meaſured, and exact. Hence, the early formation of *verſe*, which, when once adopted, would, for the reaſons before mentioned, be immediately employed, to convey their laws, and hiſtories, to future ages. It differed but little from the common ſtile of their orations. At leaſt, the difference was not to be compared with that, which is found in the more advanced periods of ſociety, and of language.

We have already obſerved, that, in the early ages of mankind, when their lives were filled with toils and dangers, and when new and intereſting events were continually opening upon them, their paſſions would correſpond to their ſituation, and would be various, vehement, and active. Civilization and ſcience have, as it were, minced into finer portions, the feelings of the heart. By this means, we enjoy a far *greater number* of pleaſurable ſenſations, and, upon the whole, I doubt not, a much *larger ſum* of happineſs. The life of an Indian conſiſts, either of glare, or of darkneſs. He is either tranſported with paſſion, or ſunk into ſtupor. Theſe larger maſſes have been broken, by the hand of culture, into ſmaller pieces, which are in perpetual currency, and which maintain, among us, a more equal and conſtant enjoyment.

But, from hence it will follow, that the *ſtrong poetic character* may be expected to decline, as TASTE improves. We may, perhaps, hope to excel,

in ſoftneſs, delicacy, and refinement. But theſe are *feeble* graces. The mind ſoon tires, with the perpetual chime of ſmooth verſification, and with the unvaried flow of gentle and unimpaſſioned ſentiment. The burſts of honeſt nature, the glow of animated feeling, the imagery, the enthuſiaſm—*Theſe* are the charming properties, which will for ever exalt the poems, in which they are found, to the *firſt order* of poetic excellence. For *theſe*, no appendages of art can be deemed an adequate compenſation.

A writer, whom I cannot mention without great reſpect, notwithſtanding our difference of opinion upon ſome intereſting ſubjects, ſeems not to have ſettled accurately his own idea of poetic eſſence. Dr. Johnſon, *many* of whoſe criticiſms upon the Engliſh Poets indicate the ſtrength of judgment, and *ſome*, the elegance of taſte, ſays, in his life of Milton, "Poetry is the art of uniting pleaſure with truth, by calling imagination to the aid of reaſon." He then mentions the different ſciences, of which the Poet ſhould be a maſter; hiſtory, morality, policy, the knowledge of the paſſions, phyſiology. "To put theſe materials to poetical uſe, is required, an imagination capable of painting nature, and realizing fiction. Nor can he yet be a Poet, till he has obtained the whole expanſion of his language, diſtinguiſhed all the delicacies of phraſe, and all the colours of words, and learned to adjuſt

all

all theſe different ſounds, to all the variety of metrical modulation." In theſe laſt words, *metrical modulation* is ſuppoſed to be a neceſſary adjunct to knowledge, and imagination. In another place, he ſays, "It is by the muſic of metre, that poetry has been diſcriminated, in all languages." And yet he had juſt before ſaid, "That, perhaps, of poetry, as a mental operation, *metre* or *muſic* is no neceſſary adjunct." I am unwilling to draw any other inference from theſe paſſages, than this, that, ſuch is the difficulty of ſettling with preciſion the poetic eſſence, even Dr. JOHNSON is inaccurate, and inconſiſtent.

If, in order to avoid this charge, it be ſaid, that a diſtinction is made, between poetry, as a *mental operation*, and poetry, as an actual expreſſion of the thoughts in *language*, then it will follow, that a perſon may be a *mental Poet*, without being a *practical* one; becauſe he may poſſeſs imagination, feeling, &c. without being able to expreſs theſe mental operations, in a proper manner. He may have poetical *ideas*, but not poetical *ſtile*. And, exactly in the ſame ſenſe, a man might be an *orator*, or a *painter*, without being able to *ſpeak* in public, or to uſe the *pencil*.

I beg leave to finiſh the ſubject, by a few obſervations on modulation of language, which have ſuggeſted themſelves, in the courſe of the foregoing ſpeculations.

Different languages vary, exceeding widely, in their capability of modulation; and, from this cauſe, will vary as much, in the *mode* and *character* of their *rhythm*, or muſical compoſition. Every good and rounded ſtile, in proſe, as well as in poetry, has a *metre*, or *muſic*, which the ear, when at all refined by claſſical taſte, can immediately *feel*, and *enjoy*. There is, in finiſhed compoſition as much of melody and ſweetneſs, in the arrangement of *proſaic* ſyllables, as in the moſt *poetical*. The ear as nicely diſcriminates the ſoft, the plaintive, the bold, the nervous, the elegant, by the flow of *muſical expreſſion*, as in the moſt exact and perfect poem. From this circumſtance alone, we are able, at once, to diſtinguiſh the ſtile of ADDISON, and SHERLOCK, of TILLOTSON and WATTS, and YOUNG. We diſtinguiſh them, as eaſily, as a connoiſſeur in *muſic*, who *feels*, at once, the compoſitions of HANDEL, and thoſe of CORELLI.

It is probable, the ears of the antient ROMANS and GRECIANS were more nicely tuned, to diſcern the melody of arrangement, and of cadence, than ours. Or, probably, we have loſt that "*tune*," or mode of pronunciation, in which their languages were ſpoken; for a modern ear cannot feel that richneſs and harmony of numbers, which appears to have been, to them, ſo inexpreſſibly delightful. "Cicero tells us, that he was himſelf a witneſs of its influence, as Carbo

was

was once haranguing the people. When that Orator pronounced the following ſentence; 'Patris dictum ſapiens temeritas filii comprobavit,' it was aſtoniſhing, ſays he, to obſerve the general applauſe, which followed that *harmonious cloſe*. And he tells us, that, if the final meaſure had been changed, and the words placed in a different order, their whole effect would have been abſolutely deſtroyed."

This muſicalneſs, and flow of numerous compoſition, which charms the ear of every judicious reader, is certainly felt moſt ſtrongly, when it is *read aloud*, with taſte and expreſſion. But when *read with the eye only*, without the accompaniment of the voice, there is a *fainter aſſociation* of the ſound, the *ſhadow of the muſic*, as it were, connected with the words; ſo that, we can judge as exactly of the compoſition, as if were audible to the ear. This power, of aſſociating *ſound* with *viſion*, is formed gradually by habit; for common people, who are not much accuſtomed to books, hardly underſtand any thing they read, unleſs it be accompanied with the *voice*. And ſome Gentlemen are ſaid to have acquired this art of mental combination ſo perfectly, as to *read*, even the *notes* of a muſical compoſition, with conſiderable pleaſure.

The difference of modulation in languages, muſt give a different character and expreſſion to their poetic compoſitions. The Grecian and

Roman tongues were ſo happily conſtructed, that their *verſe* eaſily diſtinguiſhed itſelf by its *arrangement*, and therefore needed no ſecondary or artificial aid. It has been thought, that our Engliſh tongue is not equally happy; and that, therefore, *rhyme* is, in general, neceſſary to make the diſcrimination perfect, and to give that *chime* or *muſic* to the ear, which the ſucceſſion of long and ſhort ſyllables alone, could not effect. The fact adduced in ſupport of this obſervation, by Dr. Johnſon,* is certainly true; "that very few poems, in blank verſe, have long maintained a character among us. Thomſon, and above all, Milton, are *great exceptions*, but their ſtile is ſingular. They formed themſelves upon no model; and are ORIGINALS which we may *admire*, but ought not to attempt to *copy*."

This remark, though, perhaps, in ſome degree juſt, is, however, degrading. And, if the *tag of rhyme* be, in general, neceſſary to our Engliſh poetry, it will be an additional argument in favour of that hypotheſis, which ſuppoſes METRE to be the grand *criterion* of POETIC DICTION.

Yet, methinks, the Doctor is too ſevere, when he ſays, "The variety of pauſes, ſo much boaſted of by the lovers of blank verſe, changes the meaſures of an Engliſh *Poet*, into the periods of a *declaimer*." To me, there appears a very eſſential difference,

* Life of Milton.

between

between the pauſes of *verſe*, and thoſe of mere *declamation*. The poetry of MILTON has been celebrated by the beſt judges, as inimitably beautiful and harmonious, from the amazing variety, and judicious changes, of the pauſe. Theſe are ſo admirably diſpoſed, that the ear hardly ever tires. There is none of that perpetual ſameneſs, and recurrence of ſound, which, in common blank verſe, is ſo inſufferably diſguſting. Surely, the verſe of Milton is not, "*verſe only to the eye.*" I cannot, therefore, ſubſcribe to Dr. Johnſon's ſentiment, "that all the power of Milton's poetry conſiſts, in the ſublimity of his ſentiment, or the peculiar (he elſewhere calls it 'perverſe and pedantic') arrangement of his ſtile." His ſentiments are, indeed, lofty and noble. But his *metre* alſo is inexpreſſibly rich, mellow, and harmonious. Whichever hypotheſis, therefore, we adopt, as to the conſtituent character of POETRY, that of MILTON will have *every praiſe*,—of SENTIMENT,—of IMAGERY,—of MODULATION.

## *On the* AFFINITY *ſubſiſting between the* ARTS, *with a* PLAN *for promoting and extending* MANUFACTURES, *by* ENCOURAGING THOSE ARTS, *on which* MANUFACTURES *principally depend. By* THOMAS BARNES, D. D. *Read January* 9, 1782.

" Omnes Artes, quæ ad Humanitatem pertinent, habent quoddam commune vinculum, et quaſi cognatione quâdam inter ſe continentur.

Cicero pro Archiâ Poetâ.

IT is a queſtion, not only of ſpeculation, but of real importance, " How far is it deſirable, that a man of learning ſhall devote himſelf to ONE particular OBJECT ?" Or, to put it in a different form, " Will not the intereſts of SCIENCE be beſt promoted, by a *more general* and extended application to *different* ſtudies ?"

In the life of Dr. ISAAC BARROW, we are told, that great man " entered upon ſtudies of different kinds, whereby he could not totally devote himſelf to ONE, which would have been more for the public benefit, according to his own opinion, which was; that *general ſcholars* did more pleaſe *themſelves*; but that they, who proſecuted *particular* ſubjects, did more pleaſe *others*."

Whatever

Whatever truth there may appear to be in this ſentiment, in ſome uncommon inſtances, I perſuade myſelf, it will not, in general, accord with experience. Though every man ſhould have ſome ONE OBJECT continually in view, to which he ſhould refer all his knowledge, and by which he ſhould direct all his ſtudies; yet, with this aim, let him rove abroad, through the various walks of literature. He will, probably, meet with many things, which he will now apply, with great advantage, to his main ſubject, and by which he may illuſtrate, embelliſh, or extend it. General Science, with this particular application, collects the ſcattered rays, reflected from a thouſand objects, into one focus, and blends all the variegated colours of the rainbow, into one white, and luminous point. Whatever praiſe may, in particular caſes, have been given to the man, who has travelled only in *one* path of Science, his ideas muſt neceſſarily be very confined, and he will, probably, fall under the charge of pedantry, and affectation. The Sciences are ſiſters, *affectionate* ſiſters! and, as the Roman Orator, in our motto, has beautifully expreſſed it, "Quaſi cognatione quâdam inter ſe continentur." To be in the good graces of any one of them, you muſt pay ſome reſpectful attention to the *reſt*.

General knowledge, like the general motion of the various limbs of the body, gives an agility and

and vigour to every part of the mental frame. The continual, ſolitary play of one particular limb, may give ſtrength and dexterity to the muſcles connected with that limb; but the probable conſequence will be, awkwardneſs and imbecility in all thoſe, which are not brought into action. The mere mathematician, the mere grammarian, or the *mere any thing*, may, perhaps, with microſcopic eye, ſee *one little object* very diſtinctly. But, if not accuſtomed to look around him to a wider range of viſion, his view will be narrow, and, when he turns from that lucid point, he will be enveloped with darkneſs. It is, indeed, impoſſible for the man, whoſe mind has not been expanded by ſome love of general knowledge, to appreciate the ſeveral ſciences, according to their juſt value, and to aſſign to each their proportionable ſhare of eſteem and conſequence. If Monſieur Veſtris compriſe all human excellence in dancing: if another man look down, with ſupreme contempt, upon every perſon, who has not plunged into the depths of mathematical, or metaphyſical myſteries, what is the cauſe? Is it not, the want of ſome acquaintance with other ſciences? This would have enabled him, to range the different branches of knowledge in their proper order, and to apportion to each, their proper ſhare of attention and regard.

But

But we may advance a ſtep further. The MAN OF ONE BOOK, is not likely to *underſtand* that one book, ſo well, as the man of more extended ſtudy. There is a general analogy and affinity, among all the ſciences. In all thoſe which require cultivated imagination, or improved taſte, general knowledge is abſolutely neceſſary. To form elegance of mind, there muſt be, a compariſon of ideas, a combination of images, an extenſion of ſoul. Hence ariſe, the ſenſe of ſymmetry, elevation of ſentiment, and a capacity to reliſh the beautiful, and the ſublime.

The more abſtruſe ſciences may ſeem to require *leſs*, of foreign and adventitious aid. The metaphyſician may, like a mole, work under ground, blindfold. Buried, ten thouſand fathoms deep, beneath the ſurface, he may need little the taper of the other ſciences. And yet, the fact has often been, and experience confirms it, in many inſtances, at this day, that thoſe, who have excelled moſt, even in the *abſtruſer* parts of literature, have been men of a large acquaintance with knowledge. And, in general, thoſe who have ſhone with uncommon ſplendor, in ſome *one* profeſſional, or favourite ſcience, have been diſtinguiſhed by an attachment to knowledge, in *all* its branches. NEWTON was not the *mere* aſtronomer, or calculator. BOYLE was not, merely, the natural philoſopher; nor was LOCKE, the

the mere metaphyſician. They had occaſionally wandered into the other walks of ſcience, and had brought from thence treaſures, to enrich their favourite ſtores. To theſe, how many names might be added? Barrow, Hailer, Watts—and ONE, whoſe name I cannot mention, without ſtrong and grateful ſenſations—the late Dr. AIKIN, than whom few have had mental treaſures, more various, or more valuable.*.

It is in general ſaid, that the knowledge, which, like the broad ſtream, flows over a wider ſurface, muſt be proportionably ſhallow; whilſt that which runs in the narrow channel, muſt be deep. But we are deceived by an image. We argue from a fancied reſemblance. The mind, long poring upon one object, grows tired, and feeble. It is neceſſary, ſometimes, to change the object, in order to reſtore its tone and vigour. He, who can thus diverſify his purſuits, keeps up the ſpring and energy of his powers, the

* John Aikin, D.D. was Tutor in Divinity at the Academy at Warrington for ſeveral years. Though not known to the world at large as an author, his modeſty having unhappily prevented him from appearing in print, he was uncommonly revered by all that knew him, for the wonderful extent of his knowledge, for the mild dignity of his character, and for the various excellencies which adorned the Scholar, the Tutor, and the Man. He was the father of Mrs. Barbauld, and of John Aikin, M.D. both of whom are well known in the Republic of Letters.

ardour

ardour of his ſtudies, the keenneſs of his reſearch. He borrows ideas, images, illuſtrations, from kindred ſciences. His mind widens with increaſing knowledge. He ſees every ſubject, as it were, in a larger field of viſion. He views it round, in a greater variety of aſpects. His ſoul is expanded, his judgment ſtrengthened, and all his powers aſſiſted, and improved.

But I meant, principally, to extend this ſentiment to the ARTS. Though *they* too have a near affinity, yet it is not generally imagined, that, to excel in one art, it is proper a man ſhould have any knowledge of others; eſpecially of thoſe, which appear more remote and unconnected. That a poet ſhould be a painter, or a painter a poet, may ſeem deſirable, from the ſimilarity of taſte, of genius, and of imagination, neceſſary to excellence in theſe kindred arts. But, in the lower, and mechanic employments, how ſeldom is it known, that a man, verſed in one kind of ingenious labour, has the moſt diſtant knowledge of others, even of thoſe, which ſeem moſt nearly connected with his own? How many watch-makers know very little of clock making; though, *here*, the connection is as cloſe as poſſible? How many machines are uſed at Birmingham, in the different branches of manufacture carried on there, of which a mechanic at Mancheſter, even in the *ſame line*, is entirely ignorant? There are, it is probable, in every *manufacture*, I had almoſt

almoſt ſaid, in every *place*, ſome peculiar, and local improvement, which has never yet been extended, beyond the vicinity, where it was firſt invented? Of late, indeed, the ſpirit of enterprize has gone forth, and the inventions, made in *one* manufacture, have been ſometimes tranſferred to others. The machines for ſpinning cotton, have been applied to woollen, and with great advantage. And, probably, both have been under great obligations to thoſe curious machines, for twiſting and manufacturing ſilk, which have ſo long excited general curioſity, and admiration.

So great is the analogy between the ſeveral arts, that no man knows, to what extent the improvement of any ſingle art may affect others, even where the relation, at firſt ſight, appears moſt diſtant. Who would have imagined, that the diſcovery of the properties of the magnetic needle, would have had ſuch amazing, and almoſt infinite effects? That, by this property alone, navigation ſhould become ſo aſtoniſhingly extended, new continents be diſcovered, and a NEW ÆRA opened, in the hiſtory of the globe! I was, a few days ago, greatly pleaſed with tracing the progreſs of an invention, into ſeveral branches of art, with which, at firſt, it appeared, not to have the moſt remote affinity. I refer to the Cylinder, covered with wire-cloth, of different fineneſs, originally intended only for ſifting flour, meal, and bran, immediately

immediately as they come from the mill-ſtone. For this ingenious invention, Mr. Mills got a patent, the term of which is now, probably, expired; for the perſon who ſhewed it me, informed me, that he had himſelf applied the Cylinder, with little variation, in ſifting *gunpowder*, *ſnuff*, *tanners' bark*, and ſand. So that, by this ſimple, but beautiful diſcovery, the dealers in all thoſe various articles have reaped already conſiderable advantage: and how far the advantage *may ſtill* be extended, is as yet unknown. The power of *Steam*, in producing effects, to which hardly any powers of mechaniſm are equal, has been long obſerved, in the *Fire-Engines*, in the conſtruction and application of which, Philoſophy has lent her aid to Art; and Science has become the tutor, and guide of Genius. But we have not heard, till lately, that this active and potent principle has been applied, in any other inſtances; though there are many, in which a principle ſo powerful, and, it is preſumed, ſo manageable, would be of unſpeakable advantage. The extenſion of it to machines, for *ſpinning cotton*, and for *grinding corn*, is now, I am informed, under the contemplation of different Artiſts; and, if circumſtances favour the execution, will, probably, be accompliſhed. *

* A machine for ſpinning cotton has now been worked, for ſome time, upon this principle, at Mancheſter. And the other, for grinding corn, is ſaid to be in conſiderable forwardneſs, near Black-fryars bridge, London.

That

That our manufactures, at preſent, depend very much upon our machines: that the Cotton Manufacture, in particular, is, under Providence, *entirely* dependent upon them: and, that their *utmoſt* improvement, to the very higheſt point, to which it is poſſible for them to arrive, is, in the preſent circumſtances of trade, very deſirable, for the ſake of every intereſt, and of every order of men, dependent upon our manufactures, I will not here attempt to prove. They are poſitions, denied by none, but the loweſt and weakeſt of the vulgar; where alone ſuch weakneſs is pardonable. Whatever, therefore, may tend to encourage and aſſiſt thoſe arts, by which mechaniſm may be improved, and our manufactures extended, is a matter of common utility and importance. The Clergyman, the Phyſician, the Gentleman, are, I had almoſt ſaid, *equally* intereſted with the Tradeſman, and the Merchant.

To anſwer, in ſome degree, this important end, and to ſerve, however feebly, this GENERAL INTEREST, I have imagined to myſelf a PLAN, which appeared to me, not impoſſible to be carried into execution, and important enough to be attempted. It may, poſſibly, appear to ſome Gentlemen, an *Utopian* ſcheme. Many objections may, at firſt ſight, appear to riſe againſt it. But I have all the confidence of a Projector, in ſaying, that I firmly believe, with proper attention, ſuch

as

as has been paid to other deſigns of public utility, it *might* be executed; and, if executed, *muſt* be of public advantage; an advantage, which no man can eſtimate at preſent, and the full extent of which, perhaps, no man could conjecture.

Before I ſtate this *plan*, I will beg leave to make two obſervations, in addition to what has been already ſaid, on the ſubject of improvements in our manufactures. And, firſt,

It is now *more* neceſſary than *ever*, that our artiſts and workmen, in the different branches, ſhall be poſſeſſed of ſome degree of *taſte*. And taſte is only to be acquired by that general and miſcellaneous knowledge, which it has been the object of this paper to recommend. Our manufactures muſt now have, not merely, that *ſtrength* of fabric, and that *durability* of texture, in which *once* conſiſted their higheſt praiſe. They muſt have elegance of *deſign*, novelty of *pattern*, and beauty of *finiſhing*. To effect theſe, all the aid of improved and refined art is eſſentially neceſſary. The dull plodder, accuſtomed to pace round and round, like a mill-horſe, is not likely to ſtrike out any thing new, and elegant. He may, indeed, adopt the improvements of others: but his will never be the praiſe, of ſerving his fellow-creatures, by any *inventions*, of real importance, and utility.

I would further obſerve, that, in the preſent ſtate of the Arts, capital improvements are not

to be, in general, expected from those, who would, at first sight, appear most likely to make them; I mean, the workmen in different branches of mechanism. Turn your eyes to any of our numerous manufactures. You find every division of mechanical labour, executed by a separate set of workmen. Dr. Smith, in his Wealth of Nations, tells us, "that a Pin goes through *eighteen* several distinct operations," each of which, probably, in a large concern, is performed by a different operator, who, it may be presumed, would feel himself very awkward and unready, if obliged to change employment with any other of his fellow workmen. How many hands concur, in the formation of a Watch, but very few of whom are so well acquainted with the *whole mechanism*, as to be able to put the Watch together, or to calculate the different wheels, of which it is composed.

I imagine it to be owing to this circumstance, that improvements, *upon a larger scale*, such as the invention of great and complicated machines, &c. have generally been made, by persons, *not*, originally *educated* to the profession of those arts, in which they have made such astonishing discoveries. Whilst the regular artists have had their attention fixed upon the little points, and ramifications of art, in which indeed they have become astonishingly perfect, the others, standing more at a distance, have had a wider field, a nobler

nobler object in their view, at once. Hence, their minds have been extended to a *complex whole*, the firſt faint outline of which, they have, by ſlow degrees of patient labour, finiſhed into form and beauty. Hence, almoſt all our late machines have been invented, in a part of the country, where the ſtate of the Arts is not greatly improved, and where original genius is not minced down, to the ſhreds and atoms of a long-eſtabliſhed, and widely-extended manufacture.

It is acknowledged, that mere random genius has made aſtoniſhing diſcoveries and improvements, without any aid, but that of native ſagacity. But, on the other hand, how many minds, capable, with aſſiſtance and encouragement, of producing the happieſt inventions, have, for want of them, pined in obſcurity, loſt to the world, and incapable of any great atchievement? And, we may aſk, what *might* ſuch genius have atchieved, if foſtered by ſcience, by liberality, and by honour!* What Brindley executed by

* But knowledge to their eye, her ample page,
Rich with the ſpoils of time, did ne'er unroll;
Chill penury repreſſed their noble rage,
And froze the genial current of their ſoul.

Full many a gem, of pureſt ray ſerene,
The dark unfathomed caves of ocean bear;
Full many a flower is born to bluſh, unſeen,
And waſte its ſweetneſs on the deſart air.

GRAY's Church Yard.

the mere dint of natural parts, is no exception to the rule. How much *more* might even HE have done, if aſſiſted by a more extenſive knowledge, and a more liberal education! What, if to genius and application had been added, a larger field of obſervation, a more general acquaintance with the mechanical powers, and with what thoſe powers have already done, in the various branches of Manufactures, and of Arts! How much *further* might he have advanced! That human ingenuity is not exhauſted; that machines are not yet carried to their higheſt improvement, and that they ought to be encouraged to their very utmoſt exertions, none here will queſtion.

Let us now apply theſe obſervations. I have ventured to chalk out the *outlines* of a PLAN, the ſole object and principle of which is, the improvement of our *Manufactures*, by the improvement of thoſe *Arts*, on which they depend. Thoſe arts are, CHEMISTRY and MECHANISM. In an excellent paper, read to this ſociety ſome time ago, it was lamented, "that ſo few of our dyers are chemiſts, and of our chemiſts dyers." We may add, How few of our Mechanics underſtand the principles of their own arts, and the diſcoveries made in other collateral and kindred manufactures? At this day, I am informed, not a ſingle weaver in the Norwich trade underſtands the uſe of a *Fly-Shuttle*.

But

But to proceed to our *Plan.*

The firſt object of this ſcheme is—To provide a PUBLIC REPOSITORY among us for CHEMICAL and MECHANIC KNOWLEDGE.

" In order to this, I could wiſh MODELS to be procured, of all ſuch *machines*, in the various arts, as ſeem to bear the moſt diſtant relation to our own manufactures. All the proceſſes in thoſe of *Silk*, of *Woollen*, of *Linen*, and of *Cotton*, ſhould be here delineated. Theſe would make the moſt neceſſary, and important parts of this *collection*. But to theſe might, with great advantage, be added, the aſtoniſhing effects of Mechanic Genius in *other* branches, which have not ſo *apparent* an affinity with our own.

" In this REPOSITORY, let there be, likewiſe, provided, an aſſortment of the ſeveral *ingredients* uſed in DYING, PRINTING, &c. for the purpoſe of *experiments*.

" A SUPERINTENDANT will be neceſſary, to arrange, and to apply this *collection* to its proper uſe. He ſhould be a man, well verſed in chemical, and mechanic knowledge. And let his province be, at certain ſeaſons, and under certain regulations, to give LECTURES, *advice*, and *aſſiſtance*, to thoſe who wiſh to obtain a better knowledge of theſe arts.

" Laſtly; let the expence, neceſſary to open, and to ſupport the ſcheme, be defrayed by a *ſubſcription:*

*tion:* and let every ſubſcriber have the power of nominating *one*, or *more*, to receive the advantages of this Inſtitution."

I mean only to draw the *rudeſt outline* of the plan, and would leave it to the enſuing converſation to be filled up, with colouring, or ſhade. By this ſcheme, properly methodized and conducted, I ſhould hope for *ſome* of the following advantages.

This MECHANIC SCHOOL would properly *finiſh* the education of a young Tradeſman, or Manufacturer. It would ſucceed, in its natural order, to the ſchool for *writing*, and *arithmetic*. It would ſerve as a proper ſtep of tranſition, from thence to the warehouſe; and, perhaps, it might become a regular part of a young Gentleman's preparation for buſineſs. How deſirable a part it would be, I will not here ſay. Other Gentlemen preſent are much better qualified to decide upon the queſtion.

But the *principal* advantage I ſhould propoſe from this ſcheme, is this. Here would be a kind of GENERAL ORACLE, which thoſe might conſult, who were engaged in mechanical improvements, and who might *here*, at once, gain that information, which it might coſt them months and years to obtain, by their own unaſſiſted efforts.

It would be very eaſy to enlarge, in *theory*, upon the poſſible, and probable benefits of this Inſtitution.

Inſtitution. But I check myſelf, hoping to hear, from Gentlemen more converſant with manufactures, their ſenſe of this, it may be, viſionary ſcheme.

Objections will, perhaps, have already ariſen, which may appear ſtrong: I hope not unanſwerable. That of the *expence*, I cannot allow to be of this number. Nor the difficulty of finding a proper *perſon*, to ſuperintend the Inſtitution. Nor the *regulations*, neceſſary to its internal management and conduct. If no objections, ſtronger than theſe, be found againſt it, I ſhall not deem it altogether Utopian.

Something ſimilar to this has been done, by the SOCIETY OF ARTS. But the two plans are eſſentially different. THEY give *premiums:* but THEY have no LECTURES, or modes of Inſtruction. OUR plan would be deſirable, in *every large town*, and particularly, in the *center* of *every* important manufacture.

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Whilſt I was engaged in thinking upon this plan, and, like the Artiſt, enamoured with its imaginary beauty, I met with the following paſſage in Sully's Memoirs. My feelings, in reading it, I will not attempt to deſcribe.

He tells us, that, among the great deſigns of Henry IV. which were prevented from being carried into execution, by the untimely and

tragical death of that Great Prince, was the following:

"There was to be, says he, a CABINET OF STATE, in the Louvre, destined to receive, whatever could tend to the knowledge of *Finance*, of *Science*, and of *Art*." After enumerating several of these, particularly relating to the army, such as *lists*, *plans*, *charts*, &c. &c. he adds, "I conceived a scheme, of appointing a large room, as a magazine of *models*, of whatever is most curious in machinery, relating to *war*, *arts*, *trade*, &c. and all sorts of exercises, noble, liberal, and mechanical; that all those, who aspired to perfection, might, without trouble, improve themselves in this silent school. The lower apartments, were to hold the heavy pieces of workmanship; and the higher, were to contain the lighter. An exact inventory of both, was to be one of the pieces of the great cabinet." *

What a pity is it, that this noble plan was not carried into execution! It would not have been the *least* of the embellishments of the reign of Henry. It would have done honour to the Prince, and to the age. † I mean not to disparage the utility of our modern collections, of *fossils*, *shells*, *mosses*, and *insects*. They are the works of God; and,

* Sully's Memoirs, Vol. IV.

† I have been informed, that this plan is since carried into execution, in the Palais Royal.

therefore,

therefore, worthy of our higheſt admiration. But I can eaſily conceive, that a ſcheme like this, upon a ſmaller ſcale, might poſſibly be applied to better uſe, than many of thoſe collections actually ſerve. In a town like this, the opulence, and even the very exiſtence of which, depends upon manufactures, and theſe again upon *arts*, *machinery*, and *invention*, a PUBLIC CABINET, devoted to this purpoſe, would be at-once of general ornament, and utility.

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REMARKS *on the different* SUCCESS, *with reſpect to* HEALTH, *of ſome* ATTEMPTS *to paſs the* WINTER *in high* NORTHERN LATITUDES. *By* JOHN AIKIN, M. D. *Read January* 16, 1782.

THOUGH the *cure of diſeaſes* may, perhaps, moſt ſafely be confined to the members of a profeſſion devoted by education and habit to this ſole object, yet the *preſervation of health* muſt, in ſome meaſure, be committed to the care and judgment of every individual. The diſcuſſion, therefore, of any means to obtain this end, diveſted, as it may be, of technical language and abſtruſe ſpeculation, cannot fail of being gene-

rally

rally intereſting. The moſt remarkable and uſeful account of ſucceſs in this important point, perhaps any where to be met with, has been afforded by that celebrated and much-regretted navigator Captain Cook; an account which was juſtly thought worthy of the moſt honourable approbation a Philoſophical Society could beſtow. From ſimilar ſources, relations of voyages and travels by plain, unprejudiced men, I have collected ſome other facts, probably at preſent forgotten or diſregarded, which appear to me capable of ſuggeſting ſeveral ſtriking and important obſervations relative to the preſervation of health in particular circumſtances. Theſe with a brief commentary and ſome general reflections, I beg leave to ſubmit to your conſideration.

Towards the beginning of the laſt century, ſeveral voyages of diſcovery were made in the Northern Seas; and the Greenland whale-fiſhery began to be purſued with ardour by various European nations. Theſe two circumſtances have given riſe to various inſtances of wintering in the dreary and deſolate lands of high northern latitudes; and the ſurprizing difference of ſucceſs attending theſe attempts muſt ſtrike every reader.

The firſt remarkable relation of this kind that I have found, is that of the wintering of Captain Monck, a Dane, in Hudſon's Bay, latitude

latitude 63°. 20′. He had been ſent on a voyage of diſcovery with two ſhips, well provided with neceſſaries, the crews of which amounted to ſixty-four perſons. The ſhips being locked up in the ice, they landed, and erected huts for paſſing the winter, which they occupied in September, 1619. At the beginning of their abode here, they got abundance of wild-fowl, and ſome other freſh proviſion; but the cold ſoon became ſo intenſe, that nothing further was to be procured abroad, and they were obliged to take to their ſhip-ſtores. The ſeverity of the cold may be conceived, from their ſeeing ice three hundred and ſixty feet thick; and from their beer, wine, and brandy being all frozen to the very centre. The people ſoon began to be ſickly, and their ſickneſs increaſed with the cold. Some were affected by gripes and looſeneſs, which continued till they died. At the approach of ſpring, they were all highly ſcorbutic, and their mouths were ſo extremely ſore, that they were unable to eat any thing but bread ſoaked in water. At laſt, their bread was exhauſted; and the few ſurvivors chiefly ſubſiſted on a kind of berry dug out from beneath the ſnow. When the ſpring was far advanced, no freſh vegetables could yet be found. In June, the Captain crawled out of his hut, and found the whole company reduced to *two men beſides himſelf*. Theſe melancholy relicts ſupported themſelves in the beſt

beſt manner they were able, and recovered their ſtrength by feeding on a certain root they diſcovered, and ſome game caught in hunting. At length they embarked in the ſmaller ſhip, and after undergoing numberleſs dangers and hardſhips, returned home in ſafety.

In the ſame immenſe bay, but as far ſouth as lat. 52, Captain James, an Engliſhman, wintered with his crew. His reſidence was on an iſland covered with wood; but the cold was, notwithſtanding, moſt intenſe. In the depth of winter they were able to procure very little freſh proviſion by the chace, and all became grievouſly afflicted with the ſcurvy, except the Captain, Maſter, and Surgeon. Weak and ſick as they were, however, it was neceſſary for them to labour hard out of doors during the greateſt inclemency of the ſeaſon; for, believing their ſhip ſo damaged, as to be incapable of carrying them home, they undertook the laborious taſk of building a pinnace from the timber growing on the iſland. At the return of ſpring, the young greens ſprouted up much ſooner and more plentifully here, than where Monck wintered; and it became very hot before they left the place. They loſt only two men out of a crew of twenty-two.

In the year 1633 two trials were made by the Dutch of eſtabliſhing wintering-places at their northern fiſheries; the one at Spitzbergen, the other

other on the coaſt of Greenland, in latitudes about 77 or 78. Seven ſailors were left at each, amply furniſhed with every article of clothing, proviſion, and utenſils thought neceſſary or uſeful in ſuch a ſituation. The journals of both companies are preſerved.

That of the men in Greenland takes notice, that on September 18th the allowance of brandy began to be ſerved out to each perſon. On October 9th they began to make a conſtant fire to ſit by. About this time, it is remarked, that they experienced a conſiderable change in their bodies, with giddineſs in their heads. They now and then killed a bear; but their common diet was ſalt meat. In March they were all very ill of the ſcurvy; and on April 16th the firſt man died, and all the reſt were entirely diſabled, but one perſon. This poor wretch continues the journal to the laſt day of April, when they were praying for a ſpeedy releaſe from their miſeries. They were all found dead.

The journal of thoſe who were left at Spitzbergen recites, that they ſought in vain for green herbs, bears and foxes, in that deſolate region; and killed no other game than one fox, the whole time. The ſcurvy appeared among them as early as November 24th; and the firſt man died January 14th. The journal ends February 26th; and theſe too were all found dead.

Not

Not many years after theſe unfortunate attempts, an accident gave riſe to an experiment, the event of which was ſo entirely the reverſe of theſe, that it merits very particular notice. On the ſame ſide of Spitzbergen, between lat. 77 and 78, a boat's crew, belonging to a Greenland ſhip, conſiſting of eight Engliſhmen, who had been ſent aſhore to kill deer, were left behind in conſequence of ſome miſtakes, and reduced to the deplorable neceſſity of wintering in that dreadful country, totally unprovided with every neceſſary. From their narrative, drawn up in that ſtyle of artleſs ſimplicity which affords the ſtrongeſt preſumption of veracity, I ſhall extract the moſt material circumſtances.

At their wintering place was fortunately a large ſubſtantial wooden building, erected for the uſe of the coopers belonging to the fiſhery. Within this they built a ſmaller one, which they made very compact and warm. Here they conſtructed four cabins, with comfortable deer-ſkin beds; and they kept up a continual fire, which never went out for eight months. They were tolerably ſupplied with fuel from ſome old caſks and boats which they broke up for the purpoſe. Thus provided with lodging, their principal care was about their ſubſiſtence. Before the cold weather ſet in, they killed a good number of deer, the greateſt part of which they cut up, roaſted, and ſtowed in barrels; reſerving ſome raw

raw for their Sundays' dinners. This, I imagine, muſt have been frozen; as it began to freeze ſharply before they were ſettled in their habitation. This veniſon, with a few ſea-horſes and bears which they killed from time to time, conſtituted their whole winter's proviſion, except a very unſavoury article they were obliged to make out with, which was *whale's fritters*, or the ſcraps of fat after the oil has been preſſed out. Theſe too, having been wetted and thrown in heaps, were mouldy. Their uſual courſe of diet, then, for the firſt three months, was one meal of veniſon every day in the week, except Wedneſdays and Fridays, when they kept faſt on whale's fritters. At the end of this period, on examining their ſtock, they found it would not hold out at this rate, and therefore for the enſuing three months they retrenched their veniſon meals to three days in the week, and appeaſed their hunger, as well as they could, on the other four days, upon the mouldy fritters. At the approach of ſpring they had the good fortune to kill ſeveral white bears, which proved excellent food; and, together with wild fowl and foxes which they caught, rendered it unneceſſary any longer to ſtint themſelves to ſo rigorous an allowance; ſo that they eat two or three meals of freſh meat daily, and ſoon improved in ſtrength and vigour. Their only drink during this whole time, was running water procured from beneath the ice.

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on the beach, till January; and afterwards, ſnow-water melted by hot irons. The cold in the midſt of winter was extreme. It raiſed bliſters in the fleſh; and when they went abroad, they became ſore all over, as if beaten. Iron, on being touched, ſtuck to their fingers, like bird-lime. The melancholy of their ſituation was aggravated by the abſence of the ſun from the horizon, from October 14th, to February 3d, of which period, twenty days were paſſed in total darkneſs, except the light of lamps, which they continued to keep continually burning. With all this, it does not appear that any of them were affected with the ſcurvy, or any other diſorder; and the degree of weakneſs, which ſeems implied by the mention of their recovering ſtrength in the ſpring, may be ſufficiently accounted for, merely from their ſhort allowance of nutritious food. At the return of the ſhips on May 25th, they all appear to have been in health; and all of them returned in ſafety to their native country.

The laſt relation I ſhall adduce, is one of late date, conſiderably reſembling the foregoing in ſeveral of its circumſtances, but ſtill more extraordinary.

In the year 1743, a Ruſſian ſhip of Eaſt Spitzbergen, in lat. between 77 and 78, was ſo encloſed with ice, that the crew, apprehenſive of being obliged to winter there, ſent four of their men in a boat, to ſeek for a hut, which they

they knew to have been erected near that coaſt. The hut was diſcovered; but the men, on returning to the ſhore, found all the ice cleared away, and the ſhip no longer to be ſeen; and indeed it was never more heard of. I paſs over their firſt tranſports of grief and deſpair, and alſo, their many ingenious contrivances to furniſh themſelves with the neceſſaries they ſtood moſt in need of. Their diet and way of life are the circumſtances peculiarly connected with my ſubject. After fitting up their hut as comfortably as they could, and laying in drift wood, collected on the ſhore, for fuel, they turned their attention chiefly to the procuring of proviſion. Three ſpecies of animals, which they caught and killed by various devices, conſtituted their whole variety of food. Theſe were, reindeer, white bears, and foxes. The fleſh they eat almoſt raw, and without ſalt; uſing, by way of bread to it, other fleſh, dried hard in the ſmoke. Their drink was running water in the ſummer, and melted ice and ſnow in the winter. Their preſervatives againſt the ſcurvy were, ſwallowing raw frozen meat broken into bits, drinking the warm blood of reindeer juſt killed, eating ſcurvy-graſs, when they could meet with it, and uſing much exerciſe. By theſe means three of them remained entirely free from this diſeaſe during the whole of their abode. The fourth died of it, after lingering on to the ſixth year. It is remarked

that this perſon was of an indolent diſpoſition, and could not conquer his averſion to drinking the reindeer's blood. The three ſurvivors, after remaining ſix years and three months on this deſolate and ſolitary iſland, were happily reſcued by a ſhip driven caſually upon the coaſt, and returned home in ſafety. They were ſtrong and healthy at their return, but by habit had contracted an inability of eating bread, or drinking ſpirituous liquors.

To the above relations, I ſhall add the following ſhort quotations relative to the ſame ſubject.

In a note to the account of the four Ruſſians, it is ſaid, "Counſellor Müller ſays, the Ruſſians about Archangel ſhould be imitated; ſome of whom every year winter in Nova Zembla without ever contracting the ſcurvy. They follow the example of the Samoides, by frequently drinking the warm blood of reindeer juſt killed. The hunting of theſe animals requires continual exerciſe. None ever keep their huts during the day, unleſs the ſtormy weather, or too great quantity of ſnow, hinders them from taking their uſual exerciſe."

In a manuſcript French account of the iſlands lying between Kamtſchatka and America, drawn up by that eminent naturaliſt and geographer, Mr. Pallas, I find it mentioned, that "the Ruſſians, in their hunting voyages to theſe iſlands, (an expedition generally laſting three years) in order

order to ſave expence and room in purchaſing and ſtowing vegetable proviſion, compoſe half their crews of natives of Kamtſchatka, becauſe theſe people are able to preſerve themſelves from the ſcurvy *with animal food only, by abſtaining from the uſe of ſalt.*"

Laſtly, in the excellent oration of Linnæus, *On the advantages of travelling in one's own country*, printed in the third volume of the *Amænitates Academicæ*, it is aſſerted, "that the Laplanders live without corn and wine, without ſalt and every kind of artificial liquor, on water and fleſh alone, and food prepared from them; and yet are entirely free from the ſcurvy." *

Having thus ſtated the facts which have fallen in my way relative to this ſubject, I proceed to a compariſon of their ſeveral circumſtances, and ſome remarks on the general reſult.

The *ſcurvy* appears to be the diſeaſe peculiarly dreaded and fatal in all the above-related attempts to winter in extremely cold climates. Whether the circumſtance of cold itſelf, or the want of proper food, occaſioned by it, principally conduces to the generation of this diſeaſe, is a point not clearly aſcertained. From the preceding

* "In Lapplandiâ obſervabit homines abſque Cerere & Baccho, abſque ſale & potu omni artificiali, aquâ tantum & carne, & quæ ab his præparantur, contentos vivere.

"Quare Norlandi, ut plurimum, ſcorbuto ſint infecti; & cur Lappones, contra, hujus morbi prorſus expertes?"

narrations, however, no doubt can be entertained, that it is poſſible for perſons to keep free from the ſcurvy, in countries and ſeaſons the moſt intenſely cold, provided their diet and manner of living be properly adapted to ſuch ſituations; and this, without the aid of freſh vegetables, or any of thoſe other preſervatives, which have of late been propoſed by ingenious writers.

When we compare the hiſtories above recited, it is impoſſible not to be immediately ſtruck with theſe leading circumſtances, that thoſe in whom the ſcurvy raged, fed upon *ſalt proviſions*, and drank *ſpirituous liquors*; whereas thoſe who eſcaped it, fed upon *freſh* animal food, or at leaſt preſerved *without ſalt*, and drank *water*.

It is well enough known among ſea-faring people, that freſh animal food is ſerviceable to ſcorbutic perſons; but whether the conſtant uſe of it alone would *prevent* the ſcurvy, they have no means of experiencing. As little can we learn from their experience, whether any other mode of preſerving animal fleſh than that of ſalting, will keep it in ſuch a ſtate as to be ſalubrious food. But the narrative of the eight Engliſhmen ſeems to determine both theſe important points; for their proviſion was all of the animal kind, and the greateſt part of it was fleſh, killed ſeveral months before, and kept from decaying, either by the coldneſs of the climate alone, or by the cooking

cooking it had undergone. It is evident, too, that the ſailors of Kamtſchatka, who ſubſiſt during ſo long a voyage on animal food unſalted, muſt either preſerve it by ſmoking, freezing, or other ſimilar proceſſes, or muſt uſe it in a putrid ſtate. To this laſt, indeed, from the accounts we have of the uſual diet of theſe people, they ſeem not at all averſe; though we may find it difficult to conceive, how the body can be kept in health by food abſolutely putrefied. The Laplanders, alſo, who ſubſiſt ſo entirely on animal food without ſalt, muſt have other methods of preſerving it for a conſiderable time; and, indeed it ſeems to be the conſtant practice in Ruſſia, and other northern regions, for the inhabitants to freeze their meat in order to lay it up for their winter's ſtock.

Theſe facts lead to the conſideration of the queſtion, whether ſalted meat be prejudicial, on account of the quantity of ſalt it contains; or, merely, becauſe the ſalt fails to preſerve the juices of the fleſh in ſuch a ſtate, as to afford proper nutriment? The latter, I believe, is the more prevalent opinion; yet I confeſs, I cannot but think, that ſea-ſalt itſelf, when taken in large quantities, muſt prove unfriendly to the body. The ſeptic quality of *ſmall proportions* of ſalt mixed with animal matters (and ſmall proportions only can be received into the juices of a living animal) has been proved by the well-known

experiments of Sir John Pringle. But beſides this, it may prove hurtful, by the acrimonious and corroſive property with which it may impregnate the fluids. It is univerſally allowed, that much ſalt, and ſalted meats, are very prejudicial in the diſorders vulgarly called *ſcorbutic* amongſt us; which, though in many reſpects different from the genuine ſea-ſcurvy, yet reſemble this diſeaſe in many leading ſymptoms, as laſſitude, livid blotches, ſpungy gums, and diſpoſition to hæmorrhage. And ſome of the ſymptoms of the ſea-ſcurvy ſeem to indicate a *ſaline*, and not a ſimply *putrid* acrimony; ſuch as that of the disjoining of bones formerly broken, in which caſe, the oſſeous matter of the callus is probably rediſſolved, by the ſaline principle contained in the animal fluids. On the other hand, it ſeems to be a fact, that ſeveral of the northern nations, whoſe diet is extremely putrid, (as before hinted with reſpect to the people of Kamtſchatka) are able to preſerve themſelves from the ſcurvy; therefore, putrid aliments alone will not neceſſarily induce it.

On the whole, on an attentive conſideration of the facts which have been recited, ſome of which are upon a pretty extenſive ſcale, I cannot but adopt the opinion, that *the uſe of ſea-ſalt is a very principal cauſe of the ſcurvy*; and that *a total abſtinence from it, is one of the moſt important means for preventing this diſeaſe.*

A conſider-

A conſiderable article of the diet of the eight Engliſhmen, though neceſſity alone could have brought them to uſe it, was probably of conſiderable ſervice in preventing the diſorders to which their ſituation rendered them liable. This was, the *whale's fritters*, which, though deprived of great part of their oil, muſt ſtill contain no ſmall ſhare of it. All voyagers agree, that the Samoides, Eſquimaux, Greenlanders, and other inhabitants of the polar regions, make great uſe of the fat and oil of fiſh and marine animals in their diet, and indeed can ſcarcely ſubſiſt without them. In what preciſe manner theſe ſubſtances act, is not, perhaps, eaſily explained; but as the uſe of them would, doubtleſs, cauſe an accumulation of ſimilar parts in the body, and as we find all animals deſtined to endure the ſevere cold of the arctic climates, are copiouſly furniſhed with fat, we may conclude, that it poſſeſſes ſome peculiar efficacy in defending from the impreſſions of cold.

With reſpect to the *warm reindeer's blood*, which the Ruſſian ſailors ſeem to have thought ſo ſalutary, and the uſe of which is confirmed in one of the quotations; if it has any particular effect in preventing the ſcurvy, beyond that of the juices extracted from recent animal fleſh by cookery or digeſtion, it muſt probably reſide in ſome unaſſimilated particles, derived from the vegetable food of the animal, and ſtill retaining

conſiderably of a vegetable nature. It is well known that the chyle does not immediately loſe its peculiar properties, and mix undiſtinguiſhably with the blood; and that the milk, that ſecretion the moſt ſpeedily and abundantly ſeparated from the blood, poſſeſſes many properties in common with vegetable ſubſtances. As to their other preſervative, *the ſwallowing of raw frozen meat*, I am at a loſs to account for any ſalutary effects it may have, except as an aliment rendered eaſy of digeſtion, by the power of froſt in making ſubſtances tender.

To proceed to the next important article, that of *drink*. It appears, that in all the unſucceſsful inſtances, vinous and ſpirituous liquors were uſed, and probably in conſiderable quantities. Thus, in one of the Dutch journals, notice is taken, that an allowance of brandy began to be ſerved to each man as ſoon as the middle of September. Writers on the ſcurvy ſeem almoſt unanimouſly to conſider a portion of theſe liquors, as an uſeful addition to the diet of perſons expoſed to the cauſes of this diſeaſe; and due deference ought certainly to be paid to their knowledge and experience: but, convinced as I am, that art never made ſo fatal a preſent to mankind as the invention of diſtilling ſpirituous liquors, and that they are ſeldom or never a neceſſary, but almoſt always a pernicious article in the diet of men in health, I cannot but look with peculiar

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ſatisfaction on the confirmation this opinion receives by the events in theſe narratives.

Indeed, from reaſoning alone, we might naturally be led to the ſame concluſion. A great degree of cold renders the fibres rigid; and, by repelling the blood and nervous principle from the ſurface of the body, increaſes the vital energy of the internal organs. Hence, the heart contracts more forcibly, and the ſtomach has its warmth and muſcular action augmented. In theſe circumſtances, ſtimulants and aſtringents ſeem by no means indicated; but rather ſubſtances of an oppoſite nature. We have acquired, by aſſociation, the idea of oppoſing *actual* cold by matters *potentially* or *metaphorically* hot; but this is in great meaſure a fallacious notion. On the contrary, it is found that the effects of exceſſive heat are beſt reſiſted by warm and acrid ſubſtances, ſuch as the ſpicy and aromatic vegetables which the hot climates moſt abundantly produce, and which are ſo much uſed in the diet of the inhabitants. And if it be admitted as a general law of nature, that every country yields the products beſt adapted to the health and ſuſtenance of its inhabitants, we ſhould conclude, that aromatic vegetables, and fermented liquors, are peculiarly appropriated to the warmer climates; while bland, oily animal matters are rather deſigned for the uſe of the frigid regions. Spirits, as antiſeptics, may, indeed, ſeem to be indicated, where

where there is a neceſſity of living upon corrupted putreſcent fleſh; but they cannot act in this way without, at the ſame time, rendering the food harder and more indigeſtible, and, conſequently, leſſening the quantity of nutriment to be derived from it. The temporary glow and elevation cauſed by ſpirituous liquors are, I imagine, very fallacious tokens of their good effects; as they are always ſucceeded by a greater reverſe, and tend rather to conſume and exhauſt, than to feed and invigorate, the genuine principle of vital energy. Another extremely pernicious effect of theſe liquors, is, the indolence and ſtupidity they occaſion, rendering men inattentive to their own preſervation, and unwilling to uſe thoſe exertions, which are ſo peculiarly neceſſary in ſituations like thoſe deſcribed in the foregoing narratives. And this leads me to the conſideration of a third important head, that of *exerciſe*.

The utility of regular and vigorous exerciſe to men expoſed to the cauſes inducing ſcurvy, is abundantly confirmed by experience. Captain Cook ſeems to attribute his remarkable ſucceſs in preſerving the health of his crew, more to great attention to this point than to any other circumſtance. This opinion is greatly corroborated by the relations before us. Captain Monck's crew, wintering with their ſhips in ſafety before them, and well furniſhed with all kinds of ſea ſtores, could have little occaſion for labour. The two companies

companies of Dutchmen ſeem to have done little during their melancholy abode, but drink brandy, and ſmoke tobacco over their fires. On the other hand, Captain James's men were very ſufficiently employed in the laborious taſk of building their pinnace, which, notwithſtanding their weak and ſickly ſtate, they had nearly completed, before they found the work unneceſſary. The three Ruſſians on Eaſt Spitzbergen who ſurvived, are expreſsly ſaid, to have uſed much exerciſe by way of preſervative; as alſo, according to Counſellor Müller, do thoſe who winter on Nova Zembla. A difficulty, however, here occurs; which is, that we know it to be the cuſtom of the inhabitants of the very northern regions, to ſpend their long winter night almoſt entirely under ground; ſeeming, in that reſpect, to imitate the animals of the country, which lie torpid in their holes and dens during the winter. From the journal of the eight Engliſhmen, too, I ſhould judge, that they were inactive during the greateſt part of the time that the ſun was inviſible. But it is to be remarked, that in theſe inſtances, what I conſider as the moſt powerful cauſe of the ſcurvy, the uſe of ſalted proviſions, did not exiſt; and therefore leſs powerful preſervatives would be neceſſary. Further, the Engliſh crew had a very ſcanty allowance of proviſion of any kind; which would, doubtleſs, take off from the neceſſity of much exerciſe. Thus, the animals which ſleep out the winter,

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take in no nutriment whatſoever, and therefore are not injured by abſolute reſt.

Exerciſe is probably ſerviceable, both by promoting the diſcharge of effete and corrupted particles by excretion, and by augmenting the animal heat. As far as cold in itſelf can be ſuppoſed a cauſe of diſeaſe; its effects will be moſt directly oppoſed, by increaſing the internal or external heat. And this leads to the conſideration of the further means for guarding againſt and tempering the intenſe ſeverity of the wintry air in theſe climates.

It appears from the journals of the unfortunate ſufferers in theſe attempts, that they endured great miſeries from the cold; their fuel ſoon proving inſufficient for their conſumption, and their daily increaſing weakneſs preventing them from ſearching for more, or keeping their fires properly ſupplied. On the other hand, the Engliſh and Ruſſians had not only made their huts very ſubſtantial, but had ſecured plentiful ſupplies of fuel. And the nations who conſtantly inhabit the arctic regions, are repreſented as living in an actually warm atmoſphere in their ſubterraneous dwellings, and guarded by impenetrable coverings when they venture abroad. The animals, too, which retire during the winter, are always found in cloſe caverns, or deep burrows, rolled up, and frequently heaped together in numbers, ſo as to preſerve a conſiderable degree

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of warmth. Of the ſeveral methods of procuring heat, there can be little doubt, that warm clothing, and the mutual contact of animal bodies, muſt be the moſt friendly, as being moſt equable, and not inviting ſuch an influx of cold air, as is cauſed by the burning of an artificial fire. And the advantage of ſubterraneous lodgings is proved by the well-known fact, of the unchanging temperature of the air at certain depths beneath the ſurface.

Theſe are the moſt material obſervations that have occurred to me, on reflecting upon the remarkable hiſtories and facts above related. I would flatter myſelf that they might aſſiſt in the framing of ſuch rules and precautions, as would render the ſucceſs of any future attempts of the like kind, leſs precarious. I ſhall be happy, if they prove acceptable to the Society, to whom I have the honour of addreſſing them; and ſtill more, if they in any degree conduce to the welfare of mankind.

## *An* ESSAY *on the* PLEASURE *which the* MIND *receives from the Exerciſe of its Faculties, and that of* TASTE *in particular. By* CHARLES DE POLIER, *Eſq. Read February* 27, 1782.

" Denique ſit quodvis ſimplex dentaxat et unum."
HOR. de Art. Poet.

THAT the exerciſe of the mind is no leſs neceſſary to the exiſtence of man, than that of the body, appears incontrovertible. The ſenſes of the brute part of the creation, are ſo much more perfect than ours, that thereby they are enabled to purſue whatever is favourable, and to avoid whatever is detrimental to them. In giving us the powers of the underſtanding, the Author of the univerſe hath abundantly ſupplied that defect. By them, we not only riſe ſuperior to the beaſts in every means of providing for our ſupport, our defence, and our welfare; but we have improved upon nature, and made the whole world ſubſervient to our wants, and to our deſires. It was not, however, the intention of Providence, that thoſe advantages ſhould be gained without any trouble on our ſide. The intellectual faculties, for the moſt part, lie dormant in us; to rouſe them, ſtrong exertions are neceſſary; and men naturally fond of eaſe, and

and prone to indolence, would for ever, perhaps, remain in a state little superior to that of the brutes, if necessity, at first, and pleasure afterwards, did not call forth these latent powers.

Pleasure, the parent of joys and amusements, will be found alike the parent of Sciences, and of Arts; Nature, in her kindness to man, having annexed an agreeable and pleasing sensation to *whatever gives exercise to the mind without fatiguing it.* To this, we are *indebted* for the improvements made to arts, taught, at first, by necessity; and for the discovery of many more, either agreeable or useful. Nay, such is the charm of that exercise, that it has been known so to elevate the soul, as to detach her, as it were, from the body;* and freeing her from its shackles, set

* We read in *Aulus Gellius*, that *Socrates*, to exercise his patience, as he says, but perhaps to indulge, in all its extent, the pleasure we are here speaking of, used to stand for twenty-four hours together, in a steady posture, unmoveable, without even so much as winking his eyes, which he constantly kept fixed upon the same place, entirely absorbed in his own thoughts, and seeming, as if an actual secession had taken place between his soul and body.

It will be but doing justice to *Aulus Gellius*, though not a very elegant writer, to set down here his own words.

"Stare solitus Socrates dicitur pertinaci statu, per dies atque per noctes, à summo lucis ortu ad solem alterum orientem, inconnivens, immobilis, iisdem in vestigiis, et ore atque oculis eundem in locum directis, cogitabundus, tanquam quodam secessu animi facto à corpore."

*Aul. Gell.* Noct. Attic. Lib. II. Cap. 1.

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her in that ſtate, ſo beautifully deſcribed by *Akenſide*, when he ſays, in his Pleaſures of Imagination,

---------- "The high born ſoul
Diſdains to reſt her heav'n aſpiring wing
Beneath its native quarry. Tir'd of earth
And this diurnal ſcene, ſhe ſprings aloft,
Through fields of air; purſues the flying ſtorm,
Rides on the vollied light'ning through the heav'ns;
Or, yok'd with whirlwinds and the northern blaſt,
Sweeps the long tract of day."

I omit the reſt of that noble paſſage, too long to be here inſerted; but written *with all the enthuſiaſm of poetic genius, joined to all the ſweetneſs and harmony of numbers.*

Vide AKENSIDE's Pleaſ. of Imag. B. I. Ver. 183.

The hiſtory of *Archimedes*, the famous Sicilian Philoſopher, is well known. Neither the ſenſe of decency on one occaſion, nor the ſenſe of danger on another, could divert his thoughts from the object they had in view, and from the pleaſure they afforded him. If the truth of theſe ſurprizing anecdotes may be doubted, let us at leaſt acknowledge the poſſibility of them, from what we may obſerve every day among us. Would not one imagine, on ſeeing a Cheſs-player, for inſtance, ſo entirely wrapt up in himſelf, as to appear inſenſible to every thing around him, that he is taken up with the care of his own fortune, the preſervation of the ſtate, or ſome ſuch

such great and important subject? And yet, all this intenseness of thought is produced by the position of a small piece of ivory, which gives exercise to his mind, and procures him that pleasure in which he seems so totally absorbed. Other instances might be adduced. The entertainment we receive from *riddles*, *charades*, and such other *Jeux d'Esprit*, proceeds from the same source. Every reader, of acute understanding and refined taste, delights to meet in authors with such *delicate* thoughts, as not being immediately obvious, are just concealed enough to give him the pleasure of finding them out, and as such, may be compared to *Virgil's Galatea*,

"Et fugit ad Salices, et se cupit ante videri."
VIRG. Buc. Ecl. 3.

There have been some men who have thought, that the exercise of the mind was only agreeable, by anticipating the reputation which it might give. But, however strongly the motive of fame may operate on the minds of some, yet the proposition, when attempted to be made general, is confuted by daily experience. How often do we employ whole hours in reading and meditation, without the least view to futurity, and merely to gratify the present moment? Does not this prove, that, independent of any other incentive, there is a pleasure inherent in whatever exercises the mind without fatiguing it?

This principle does not hold good of the *mind* only, but is equally applicable to every other component part of our being. There is an agreeable ſenſation annexed to whatever exerciſes the organs of the *body* without weakening them; and in the ſentiments or emotions of the *heart*, whatever keeps clear of the tumult of the paſſions, is attended with a degree of pleaſure. Proofs of theſe poſitions might be brought innumerable, but would probably be unneceſſary. Moſt of the ancient philoſophers have laid them down, as the foundation of their ideas of human perfection: and there are few perſons, I believe, of any reflection and experience, who have not felt the truth of them in themſelves, or obſerved it in others. Illuſtrations might, perhaps, be more agreeable than proofs; but in a ſubject of ſuch an extent, and which embraces no leſs than the whole circle of phyſiology, ethics, and *Belles Lettres*, it is neceſſary to confine oneſelf, and I ſhall therefore do no more at preſent, than offer to the Society ſome few imperfect remarks, on ſuch works of art, as give exerciſe to the mind, and come, chiefly, under the province of that faculty of the underſtanding, known by the name of *Taſte*. This choice is not altogether arbitrary. Mere intellectual pleaſures, however agreeable in themſelves, by overſtraining the mind, become at length painful. Organic enjoyments laſt only as long as we are in vigour. But the

pleaſures

pleasures of the eye and the ear, as Lord *Kaims* ingeniously observes, in his *Elements of Criticism*, holding the middle way between these two, are particularly fitted to occupy the mind without exhausting it. They relax it after intense study, and restore it to its proper tone, after the satiety and disgust, caused by the mere pleasures of the senses: they tend, therefore, most essentially to prove the principle I mean to illustrate.

We shall find, accordingly, that the agreeable sensations we receive from the productions of the fine arts, are, in a great measure, owing to the order and symmetry, which enable the mind to take in, without labour, all the different parts of them. It is by this, that *rhyme* becomes agreeable in poetry. Some have contended indeed, that this return of the same sounds, invented in the Gothic ages, ought to be classed among the Acrostics, Anagrams, and such other frivolous productions, whose only merit lies in their difficulty. They instance the Greeks and the Romans, whose poetry, far more harmonious than ours, charms the sense, and delights the ear, without the help of rhyme. But they do not seem to have attended sufficiently to the use of poetry, and the nature of the ancient languages. Verses are made to be sung, or to be rehearsed. From the mouth of the actor, the musician, or the reader, whoever he may be, they are supposed to pass into the minds of a whole people; and

their compoſition is the more perfect, the more readily they preſent themſelves to the memory.

The Greek and Latin tongues, by means of their long and ſhort ſyllables, and the various meaſures into which they may be reduced, form a kind of *chaunt*, *melody*, or *noted air*, which the memory can eaſily lay hold of, and therefore, the return of the ſame ſounds, becoming uſeleſs, would cauſe nothing but a diſagreeable repetition.

Our modern languages have not the ſame advantage, or poſſeſs it, at leaſt, in a much leſs degree. The blank verſe of the Engliſh, German, and Italian, except in very few ſhining exceptions, ſeems (as was quoted ſome time ago, in a very ingenious paper preſented to this Society) *to be verſe only to the eye*, or depends at leaſt ſo much on the ſkilfulneſs of the reader, as not to obtain the effect above-mentioned, with by far the greateſt part of thoſe who read them. Poems, where it is uſed, are not popular: the ideas they convey, the ſentiments they mean to inculcate, however forcibly expreſſed, do not eaſily recur to the memory: and, I dare ſay, that for one perſon who remembers a paſſage from *Milton*, *Young*, or *Akenſide*, there are twenty who will quote ſome from *Pope*, *Dryden*, or *Prior*.

This controverſy has long been decided in *France*, where, notwithſtanding the ſtrenuous efforts of one of its greateſt poets (Monſieur de

la

la Motte) rhyme has kept in poetry the dominion, which the nature of the French language inconteſtably gave it.

In *England*, where a *Shakeſpeare* and a *Milton* have written, the matter ſeems yet to be *ſub Judice*. It would ill become me, as a young man, and a foreigner, to be that judge; but I may be indulged in ſupporting what I have alledged here in favour of rhyme, by the opinion of the beſt critic now living in this nation, Dr. *Johnſon*; who, admiring the powers of *Milton*, and the amazing dignity given to his ſentiments, by a verſification which he otherwiſe rather diſapproves, adds, "He that thinks himſelf capable of aſtoniſhing, may write blank verſe: but thoſe that hope only to pleaſe, muſt condeſcend to rhyme."*

Another general objection has been brought againſt rhyme. "How comes it, ſays Monſieur de la Motte, that this monotony, which you affirm to be, by its nature, ſo agreeable in poetry, is almoſt conſtantly ſo unpleaſant in a ſiſter-art, in muſic?" To this might be anſwered, that the chief object of the muſician being to delight by the ſounds, he cannot ſucceed better, than by varying them judiciouſly: whereas, a Poet is not ſatisfied with charming the ears of his audience; he wiſhes to impreſs on their

* Dr. *Johnſon*'s Life of *Milton*.

memory a ſeries of ideas, of ſentiments, of expreſſions; and there are none of his verſes which he would not be glad to engrave, with indelible characters, on the hearts of all mankind. He avails himſelf, therefore, of the rhyme which modern languages offer him, as the moſt favourable help towards the attaining of his purpoſe.

But to return to our ſubject, from which I muſt beg pardon for having wandered ſo far. Imitation, which is the principle of all the fine arts, is another ſpecies of ſymmetry, whether it acts by means of colour, of ſounds, of geſtures, or of words. The objects it preſents, eaſily take hold of our imagination, by the compariſon we make of them with objects already known to us.

*Ariſtotle* and his followers have maintained, that the pleaſure produced in the mind, by the repreſentation of any object, was owing to its acquiring, by that means, a new degree of knowledge. This opinion ſeems wrong, becauſe it allows no difference between a juſt, and an unfair repreſentation; nor any gradation of pleaſure, from the different degrees of execution. The mind every way makes a new acquiſition of knowledge, and muſt, therefore, receive agreeable ſenſations alike, from the *Iliad of Homer*, and the *Thebaid* of *Statius*; the pictures of *Raphael*, and thoſe of a ſign-painter; the muſic of *Handel*, and the uncouth notes of an Iriſh piper.

Other

Other philosophers have asserted, that the representation of an object pleases, only by its interesting the passions. And so far it is true, that the soul cannot be moved, or strongly affected, without it. But does not even the least interesting object make a slight impression of pleasure, at least on the surface of the soul, if it is well represented, and if an exact symmetry is to be seen between the picture and the original? Every body must have felt it; and it proceeds from this principal law in the nature of our sensations—that any object becomes agreeable, whose parts are so formed, and so disposed, as to present the mind with an easy, clear, and distinct idea of the whole.

What is called *Contrast* in painting, poetry, and eloquence, is another sort of symmetry, which, by bringing contrary objects near to each other, sets off the features of the one, by the comparison we make of them with the features of the other. This relation has been taken from nature, in whose works it seldom fails of having a pleasing effect. It is from it, that the views in *Switzerland*, and in other mountainous countries, are so particularly agreeable. The dissimilitude of the objects, which the eye embraces, renders them all more striking, and helps the mind to get a clearer idea of the whole. Thus, when skilfully applied to the productions of art, contrast is generally attended with great success. We accordingly read, that the ancient

ſculptors, in order to ſet off the beauty of a *Venus*, a *Grace*, or an *Apollo*, uſed to place them in a niche formed in the ſtatue of a *Fawn*, or a *Satyr*; and *Virgil*, in order to paint more ſtrongly the agitation of *Dido*'s heart, places the ſcene of her agonies in the night, when *Morpheus* ſpread his peaceful influence over all the reſt of mankind.

There are, beſides ſymmetry, certain *relations* or *proportions*, which the mind eaſily conceives, and which therefore become agreeable. Thus, in architecture, for inſtance, the height of the porticos, in regular buildings, is double the breadth: the height of the entablature, is a fourth, and that of the pedeſtal, a third of the height of the column. All eminent architects, among the different proportions adapted to their deſign, have always made choice of thoſe, which the mind could comprehend without any difficulty. The ſame may be obſerved in muſic. Of all concords, the *uniſon* and the *octave* ſhould be the moſt agreeable, becauſe they excite more vibrations in the fibres of the ear: but the pleaſure we receive from this enchanting art, depends more on the mind, than on the organ adapted to convey it. The *fifth* is the moſt agreeable of all concords, becauſe it preſents to the mind a proportion, the finding out of which, gives it a degree of exerciſe, that cauſes no wearineſs, conſequently no diſguſt.

Some compoſitions there are in muſic, which pleaſe only profound muſicians, and ſtrike, perhaps,

haps, the rest of the hearers, as harsh and discordant. May not this be owing to the very fine taste of the former, by which they are enabled, in the midst of seeming dissonances, to find out relations, which do not affect ears less exercised than theirs?

The analogy which we find in all the works of nature, allows us to conjecture, that the same law, which determines the agreeableness of sounds, has also an influence upon other objects of our senses. Some colours, for instance, set together, give an agreeable sensation to the eye, and more so, than if they appeared single. The same principle may, perhaps be extended to smells, and to savours, with some restrictions, however; for, though it may be generally asserted, that those which are salubrious are agreeable; yet it must be owned, that their agreeableness does not always seem to depend on their salubrity.

But it is not just proportion and symmetrical relation alone, that renders the works of the fine arts agreeable. They are chiefly made so, by one principal object or common end, to which all their different parts are adapted, and which enables the mind the more easily to comprehend, and to retain them.

Wisdom, in morality, has been defined—The having one good purpose in view, and using the best means to attain that purpose. So *beauty*, in the imitative arts, might be said to consist, in the choice

choice of a good object, and in making every thing tend to the expreſſion of it, as to one common end. Certain it is, that this correſpondence of the parts with the whole, is to be conſidered, as the firſt and principal cauſe of agreeable ſenſations. It is alone ſufficient to give beauty to the moſt ſimple objects; and, if other embelliſhments are wanted, it becomes the ſtandard of their propriety, and the rule by which we can determine, whether they are real beauties, or only ſhining blemiſhes. But to give the mind an eaſier and more agreeable perception of the object, art has ſtill gone farther. Among all theſe parts which are made to refer to one common end, a principal one is choſen, to which all others are ſubordinate, and which becomes like a center of re-union for them. Architecture can illuſtrate this. Unacquainted with the real beauties of their art, the Gothic architects never failed to place, on both ſides of the body of their buildings, ſuch enormous wings, or rather maſſes of ſtone, as almoſt totally eclipſed it, and kept the ſight divided and undetermined. *Bromante*, *Palladio*, and after them moſt of the modern architects, taught, perhaps, by *Vitruvius*, but certainly more acquainted than their predeceſſors with what would ſtrike the eyes agreeably, have placed, in the middle of their buildings, a principal part, which, eminent above the reſt, gives the ſight a fixed point, from which it can glance

glance over all the rest, and so enable the mind to get, at once, a clear and distinct idea of the whole.

All sculptors, in those works, where the eye might be divided by the number of figures, such as, *groups*, *entaglios*, *basso-relievos*, shew great attention to this rule, and always chuse a principal object, to fix the sight of the beholders. The three *Rhodian* artists, whose joint work, according to the elder *Pliny*,* has produced the famous group of *Laocoon*, which now stands in the *Belvidere* at *Rome*, seem to have had that principle strongly in view, in the disposition of their figures. The Society, I trust, will forgive me, if, by way of illustration, I here join a description of that celebrated monument of human powers, which *Michael Angelo*, himself a wonder of modern times, used to call, a miracle of art. This description I shall, for the most part, take from a *French* book, which deserves to be better known in this country, from whence so many annually go to visit the classical ground of *Italy*, and so many in vain, from the want of proper guides. I mean, *Le Description historique et critique de l'Italie, par Mons. l'Abbé Richard*, 6 vol. 12^mo^. Paris 1769. In English,

* "Sicut in Laocoonte, qui est in Titi domo, opus omnibus, et picturæ et statuariæ artis, anteferendum, ex uno lapide, cum et liberos, draconum, mirabiles nexus, de Consilii sententiâ fecere, summi Artifices, *Agriander*, *Polidorus*, et *Athenedorus*, Rhodii."

PLIN. Hist. Nat. Lib. XXXVI. cap. 5.

An

An hiſtorical and critical Deſcription of Italy. By Abbé Richard. Six vols. 12^mo.

The group of *Laocoon* was found in the *Thermes*, or *Baths* of *Titus*, about the year 1506, under the pontificate of *Julius* II. who immediately bought it from the poſſeſſor of the field, where it had been dug out. The figures are higher than nature, and of ſo beautiful white marble, that the ſight of it alone charms the eye. The workmanſhip is exquiſite, of ſuch a noble ſtyle, and ſuch a correctneſs of execution, as beſpeak it a work of the beſt *Grecian* age. It is not the *Laocoon* deſcribed by *Virgil*, as rending the ſky with his ſhrieks, ſtruggling hard for his life, and roaring, like a bull flying from the altar where he has been wounded.

" Clamores ſimul horridos ad ſidera tollit,
Quales mugitus, fugit cùm ſaucius aras
Taurus."

VIRG. Æneid. II.

" His roaring fills the flitting air around.
Thus, when an ox receives a glancing wound,
He breaks his bands, the fatal altar flies,
And, with loud bellowings, breaks the yielding ſkies."

DRYDEN.

It is not that man, execrated by a whole people, for having diſcharged a ſpear againſt the horſe conſecrated to *Minerva*, and whom the vengeance of the Gods purſues.

—" Scelus

- - - - - - " Scelus expendisse merentem
Laocoonta ferunt, sacrum, qui cuspide robur
Læserit."

VIRG. Ibid.

- - - - - - " The general cry
Proclaims *Laocoon* justly doom'd to die,
Whose hand the will of *Pallas* had withstood,
And dar'd to violate the sacred wood."

DRYDEN.

It is a wretched parent, who feels his strength exhausted, and is ready to sink under the accumulated weight, of exquisite pain, and deep felt affliction. His mouth half opened, and his eyes lifted up to heaven, seem to call for assistance from the Gods, though despair at the same instant overwhelms him at the sight of his own fate, and that of his unfortunate sons, half smothered and devoured by the monsters, who crush them all three. The expression of that group is admirable: but the sculptors have distinguished a principal object in it: for, although the sons are equally well executed, and the one to the left in particular claims our sympathy, by the horrid state of pain in which he is represented, (one of the serpents beginning to tear open his side) yet the father attracts the chief notice. He is that principal part of the whole, to which all others are referred; and it is by that judicious subordination and reference, that the artists have found means to impress the spectator with all the sentiments they meant to convey, and which, without labour to the mind, give it all

all the pleaſure ſuch a repreſentation is able to produce.

The pleaſure we receive from a good painting, is alſo chiefly owing to this ſubordination of parts, and reference of them to the principal object. Painters call it *compoſition*; and thoſe maſters have obtained the firſt rank among them, who have been moſt attentive to it. It was *Raphael*'s, and *Ruben*'s forte; and, being the happy reſult of great genius, combined with a well cultivated taſte, is always ſure of cauſing the moſt agreeable ſenſations to the mind, that contemplates the effects of it.

In poetry, but particularly in epic and dramatic performances, the obſervation or neglect of this rule becomes, likewiſe, the teſt of the pleaſure they afford to a perſon of taſte. The different actors that appear in the narration, or on the ſcene, muſt all concur in their different ſtations to ſet off the main object, and keep the attention fixed upon it, or elſe, the mind, diſtracted with a multiplicity of objects, that ſeem to lay an equal claim to its notice, and perhaps to its feelings, grows weary, diſguſted, and indifferent to them all. *Unity* of *action*, in painting and in poetry, is another conſequence of the attention of artiſts to the principle I meant to illuſtrate. For nothing can be more ſatisfactory to the mind, than to take in, as it were, with a glance, a multitude of facts connected together,

by

by their mutual relation to some great and important action. One may introduce, indeed, in a poem, several *fables* or *plots*, and collect in it, as it were in a gallery of pictures, a series of portraits. It is what *Ovid*, *Statius*, *Arioſto*, *Shakeſpeare*, in his hiſtorical plays, and several others, have done. But, many centuries before the oldeſt of them, the great genius of *Homer* had conceived, that it would be preſenting a ſpectacle far more agreeable to the mind, if a multitude of perſons were collected together in the ſame picture, and were made to contribute to one and the ſame action; and upon that idea he formed the plan of the epic poem.

Many years after him, *Æſchylus*, the firſt who gave ſome order and ſome propriety to the drama, took from the epic poem, the plan of *tragedy*, which he made to be, the repreſentation of an event unfolded in all its circumſtances. That great Poet likewiſe underſtood, that this repreſentation would far more pleaſe the mind, if all the ſcenes of it were connected by ſome principal action, which would help the memory to retain them eaſily.

He carried, moreover, this idea ſtill farther, and to the *unity* of *action*, joined thoſe of time and place. *Sophocles* and *Euripedes*, but eſpecially the former, followed him pretty ſtrictly, and *Ariſtotle* drew his rules from their practice. Swayed by the authority of great names, and, perhaps, led away

away too far by this principle, that there is a pleaſure inherent in whatever enables the mind to get a clear and diſtinct perception of the object preſented to it, the *French* critics defended, and the *French* dramatic poets wrote after theſe rules. In *England*, the amazing genius of *Shakeſpeare*, probably unacquainted with *Ariſtotle* and his precepts, having early, and in general happily, ſoared above all reſtraints, gave, perhaps, a bias to the taſte of the nation; or a ſanction, at leaſt, to future dramatic authors, for not attending ſcrupulouſly to the ſtrict unities. Theſe, however, were alſo defended by the *Engliſh* critics, and, in theory, admitted by the beſt poets: but the practice did not correſpond; and there is not at preſent a theatre in *Europe*, in which theſe rules are leſs obſerved.

I do not mean this, as an abſolute reproach. Convinced, as I am, that the pleaſures of the heart are much ſuperior to thoſe of the mind, I think, that rules invented to give eaſe and pleaſure to the latter, may often be ſacrificed to a multitude of intereſting events and ſituations, that raiſe ſtrong emotions in the former, and ſtrike it forcibly. But at the ſame time, illuſion being the charm of theatrical repreſentations, care ought to be taken not to deſtroy it, nor diminiſh the concern and ſympathy of the ſpectators, by too great a deviation from probability. If, on the ſtage, an old man were to play the part of a young

a young one, if, the scene being in a palace, the sceneries were to present trees and landscapes to our view, if the dresses did not correspond, in some degree to the dignity of the persons represented, all these discordances would offend us.

The same is applicable to the deviation from the three unities. If, in a drama, the principal actions are multiplied, if in the space of a few hours, many centuries are made to elapse, if the spectator is transported in an instant, from one part of the world to another, all these absurdities become so many warnings against the falsity of the spectacle; and a voice seems to issue out of them, which bids us, not to give sincere tears to feigned misfortunes.

Such are the arguments of the critics, who follow the rules of *Aristotle*. Lord *Kaims*, on the other side, proves, from the different nature of the Grecian, and the modern drama, that the unities of time and place are, by no means, so necessary with us, as they were with the ancients.

The interruption of the representation, on our theatre, between the different acts, gives the mind a facility of supposing any length of time, or change of place; and it becomes not more difficult for the spectator, at the beginning of an act, to imagine a new place, or a different time, than it was at first, to imagine himself at *Athens*, or in a period of time two thousand years back.

But the ſame freedom cannot be taken with the unity of action. The pleaſure, which the mind, as we obſerved above, receives from a chain of facts connected together, and tending to one common end, renders this unity eſſential, alike in epic and dramatic compoſitions. Every thing, however beautiful in itſelf, that breaks this chain, or interrupts this relation, looks like an excreſcence, and becomes unpleaſant. An epic poem, with two principal actions, like a play, with two main plots, would ſoon confuſe and tire the reader and the ſpectator; and ſo far do the rules of *Ariſtotle* agree with nature. An *epiſode* and an *under-plot* may be allowed for the ſake of variety; but they muſt be connected with the principal action, or elſe they become great blemiſhes. *Milton*, in this reſpect, as indeed in many others, has the advantage over *Homer* and *Virgil*. His epiſode, of the battle of angels, and the creation of the world, is more intimately connected with his ſubject, than the deſcription of *Achilles'* ſhield, or even the deſcent of *Æneas* into hell. Far from breaking the unity of action, it rather ſtrengthens it, by making us acquainted with the cauſe of what we have read, and of what is to follow. It is, therefore, productive of great mental enjoyment, as there is no relation that pleaſes the mind more, than that of cauſe and effect.

This

This great rule, of the unity of action, is an insuperable objection to tragi-comedy; and inattention to it shocks persons of taste in some of our best plays. In the *Provoked Husband*, for instance, all the scenes relating to the family of the *Wrongheads*, however laughable, and characteristic in themselves, are certainly to be accounted blemishes, because they stop the tide of sentiment raised by the interesting scenes, between a sensible, loving, and justly incensed husband, and a giddy, extravagant, though good-natured wife.

This dissertation on the unities, will also be looked upon, I fear, as an excrescence to this paper, already too long; but I indulged myself in it with the thought, that it might, probably, give room to some interesting conversation—the avowed purpose of the essays presented to this society—and in that light, I beg, and I hope for, your indulgence.

From what has been read, it will appear, that *regularity* and *contrast*, *proportion* and *congruity*, *uniformity*, *variety*, and *simplicity*, in the objects presented to the mind, give it an exercise, which is attended with neither trouble nor fatigue, and which is therefore agreeable.

That these sources of pleasure exist in our nature, seems evident, from their being uniform and universal; and that they were given us for wise and good purposes, is what no one can

diſpute, who conſiders, with what care the great Author of our being has provided us with all means of happineſs. They evidently contribute to it, by adding beauty to the objects that ſurround us, and by procuring us enjoyments far ſuperior to thoſe of the ſenſes. In this view only, it would be incumbent upon us to cultivate the natural reliſh we have for them: but *Cicero*, in his admirable work *de Officiis*, ſhews us a ſtill nobler uſe, for which they may have been intended. After having enumerated the qualities which man has in common with other animals, and ſome of the advantages that diſtinguiſh him, he proceeds to ſay,

- - - - - - "Necverò illa parva vis Naturæ eſt, rationiſque, quod unum hoc animal ſentit quid ſit ordo; quid ſit, quod deceat; in factis dictiſque qui modus. Itaque eorum ipſorum quæ aſpectu ſentiuntur, nullum aliud animal, pulchritudinem, venuſtatem, convenientiam partium ſentit. Quam ſimilitudinem Natura, ratioque ab oculis ad animum transferens, multo ètiam magis pulchritudinem, conſtantiam, ordinem in conſiliis, factiſque conſervandum putat: cavetque, ne quid indecorè, effæminat evè, faciat; tum in omnibus et opinionibus et factis, ne quid libidinoſè aut faciat aut cogitet. Quibus ex rebus conflatur, et efficitur, id quod quærimus, Honeſtum."

CICER. de Officiis. Lib. I.

"The

"The energy of nature and of human reason are strikingly displayed in this circumstance, that man is the only animal endued with the perception of order, decency, and propriety in words and in actions. He alone discerns, in visible objects, beauty, gracefulness, and symmetry. And, transferring the analogy, from the sight to the mind, he becomes sensible, that superior beauty, regularity, and order, should distinguish the intention and behaviour; and cautiously avoids whatever is unbecoming and unmanly, and particularly, every loose imagination and expression. An attention to these things forms and constitutes that *Honestum*, which is the subject of our enquiry."

Lord *Kaims*, whom every lover of genuine criticism must read with pleasure, and quote with gratitude, observes also, that, "The reasonings employed in the fine arts, are of the same kind with those, which regulate our conduct. Mathematical and metaphysical reasonings (says he) have no tendency to improve social intercourse, nor are they applicable to the common affairs of life: but a just taste of the fine arts, derived from rational principles, furnishes elegant subjects for conversation, and prepares us for acting in the social state, with dignity and propriety." *

* Introduction to Elements of Criticism.

Thus we find an analogy and a connection formed, between the pleaſures of taſte, and the ſenſe of morality. The ſame principle of propriety, which leads us to the diſcovery of what is beautiful and pleaſing to the mind, when applied to the heart, will help us to find, what is virtuous, what is honeſt, and what conſtitutes the true pleaſure ariſing from its emotions. What I have attempted to illuſtrate, may then be carried farther, and we may pronounce, that, as there is a pleaſure inherent in whatever exerciſes the mind, without fatiguing it, ſo there is a pleaſing ſenſation annexed to every emotion of the heart, that is not poiſoned by fear, hatred, envy, revenge, and ſuch other irregular and diſorderly paſſions.

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## *On* Œconomical Registers. *By* J. Wimpey. *Read March* 13, 1782.

IN a country ſo juſtly reſpectable as Great Britain, for its proficiency in the Arts, in Manufacture, Trade, and Commerce, and in its literary acquiſitions in every branch of Science, it is rather ſurprizing, that there ſhould be ſo entire a deficiency in Œconomical Hiſtory.

To

To the queſtions, What may be the amount of the circulating caſh in the kingdom? What is the ſtate of its population? Has it increaſed, or decreaſed, within the laſt fifty years? Have the many and great improvements in agriculture rendered the prices of proviſions, &c. proportionably cheaper? And what is the increaſe of quantity, on an average, for half a century back, compared with preceding times?—To theſe queſtions, no ſatisfactory anſwers have been given.

Theſe are intereſting and important enquiries, concerning which, men of the beſt abilities have employed their thoughts with very little ſucceſs, as nothing, with any degree of certainty, can be concluded from what they have written upon thoſe ſubjects. Indeed, their opinions are ſo exceedingly wide of, and repugnant to, each other, that it clearly appears they have no certain data to calculate upon. This indeed is not ſo much a reflection on the preſent times, as on the paſt. But it will equally reflect on the preſent, when they, like the former, ſhall become the paſt, unleſs ſome means are adopted, to furniſh our ſucceſſors with thoſe intereſting facts, the want of which leaves us enveloped in the dark ſhades of ignorance.

Some years ſince, I was honoured with a letter from Monſieur Turgot, then high in the favour of his royal maſter, and at the head of one of

the firſt departments in the kingdom of France. He requeſted I would inform him, What might be the proportion, which the produce in grain of the lands in England of one year bore to that of another, for a ſeries of thirty or forty years. To this I could only anſwer, That we had no annual regiſter, either public or private, that I knew of, which could anſwer his queſtion; and that the only means we had of gueſſing, were, by the proportion which the price of one year bore to that of another.

This was not leſs aſtoniſhing to him, than it had been to ſeveral other ſagacious foreigners, who have ſhrewdly remarked, "that, in England, ſo keen are individuals in the purſuit of their own private emolument, and ſo ignorant and remiſs is its government, that they have frequently given a bounty of fifteen per cent. to export their corn, when all they had in ſtock was very far ſhort of being ſufficient to ſupport their own people, till the next harveſt." In this deplorable ſtate of œconomical and commercial ignorance, we continue ſtill, which I conceive might be remedied with little difficulty, trouble, or expence. But, for government to give a bounty for the exportation of grain, to the amount of from fifteen to thirty per cent. as it hath ſometimes done, without knowing, either the average quantity grown, or the quantity

its

its people conſume; and conſequently, without knowing, if the ſtock remaining on hand would feed its people till the next crop be harveſted; and whether it muſt not of neceſſity be forced to purchaſe again at double the price, as it has alſo ſometimes done, is ſurely one of the moſt abſurd meaſures, that a thoughtleſs, inconſiderate claſs of men ever adopted. It has been frequently obſerved, that our legiſlators have been very fruitful in the invention of penal laws; but in the meaſures of prevention, which are infinitely more ſalutary, they are either very inattentive, or very barren.

The queſtion of population, whether it increaſeth, or is upon the decline, is not to be aſcertained with any tolerable degree of exactneſs, without an actual enumeration of all the people in the iſland. This may be thought a work of too great extent and trouble, to be attempted. So it would, indeed, if it were to be effected by one, or a few perſons. But how very eaſy would it be, if performed by the pariſh officers? They, by the duty of their office, are obliged to have a complete liſt of all thoſe, who are rated towards the relief of the poor; and another of all thoſe who are the objects of ſuch relief. A liſt of thoſe who are not in either of thoſe claſſes, would coſt the officers of any pariſh very little trouble. Conſequently, the number in each claſs, and the ſum total of the whole, might

might be obtained with as little trouble, as the numbers in each claſs, and the ſum total, could be obtained by the officers of any reſpective pariſh.

If ſuch liſts were correctly taken every two, three, four, or five years, the ſtate of increaſe, or decreaſe, might be preciſely known, with little or no expence to any body. Of ſuch liſts, might be formed a kind of General Directory; containing the names, addition, number, ages, and ſex, of all the families in Great Britain. Thus, in Manchester,

N. R. Hatter, $\frac{1}{4}^{2}$, $\frac{3}{1}$ 3 males, 4 females.

that is, four under twelve, and three above; three of them males, four females. Let any one carry his ideas through the ſtreet he lives in, or is familiarly acquainted with, and he will ſee, with how much eaſe he may acquire a knowledge of all theſe particulars, reſpecting every family in it; and, by a ſimilar practice, on a general plan, a preciſe knowledge may be obtained of every family in the nation.

Perhaps it would be too adventurous, to attempt to recommend a knowledge thus acquired to ſome practical uſes, to which it ſeems capable of being applied, with a proſpect of the moſt beneficial effects.

A very great part of thoſe, who have no other means of ſubſiſtence, but the ſpoils and depradations committed upon the public, are, in their manner

manner of living, a kind of citizens of the world, without character, or deſcription, fixed habitation, reſidence or connection, by which they may be traced as to their mode of ſubſiſtence. And how deſirable ſoever it may be to bring them into broad day light, that every man may have his eye upon them, yet in a country, where the bleſſing of liberty is deſervedly in ſuch high eſteem, fears are awakened, ſuſpicions alarmed, jealouſies excited, leſt any incroachment ſhould be made on the liberty of the ſubject, under the ſpecious, but deceitful appearance of public good.

Were this a proper place, I would endeavour to give the true idea of genuine liberty, in which that of the individual ſhould perfectly accord, with the ſafety and happineſs of the ſtate. Like the baſe of a pyramid, it ſhould be erected on a large extended bottom, its centre of gravity coinciding with its centre of magnitude, which nothing could ſhake or overturn, till its materials ſhould be crumbled into one common ruin. At preſent, I think it ſeems to ſtand, like Fortune on the ſummit of a globe, whoſe deſcent on one ſide, is into the region of anarchy and licentious confuſion; on the other, of tyranny and ſlavery, from both which I hope we ſhall ever eſcape.

I will beg leave, however, to throw out a few hints. They may ſuggeſt the means of preventing ſome, and of detecting others, in the purſuit

purſuit of practices, which are the bane of ſociety, and a diſgrace to humanity.

Let us ſuppoſe, then, that complete liſts have been taken of every family in Great Britain, of men, women, children, ſervants, and lodgers. That every town and village were obliged to provide ſufficient number of Medals made of copper, about an inch and half diameter, with the name of the town, country, and year inſcribed round the margin That every perſo above twelve years of age, ſhould be obliged w en they went above a certain number of miles from home, to wear it about them, that they might be able to prove ſatisfactorily, who they are, and from whence they come. Acroſs the piece, ſhould be engraved the name, the profeſſion or addreſs, and the age of the perſon, at the date of the impreſſion. By this means, every perſon would have it in his power to confirm the account he might give of himſelf, by an inconteſtible voucher; and every ſuſpicious perſon, wherever he might happen to appear, ſhould be liable to be taken before the neareſt civil officer, where he ſhould produce his medal, and anſwer all proper queſtions, or be liable to be committed by any one of his Majeſty's Juſtices of peace. The want of a medal ſhould be deemed a ſuſpicious circumſtance, and the perſon ſhould be retained in ſafe cuſtody, till he could obtain ſufficient proof

of

of the place of his reſidence from the pariſh officers, or from ſome one of them.

If any labouring man, handicraft-man, artificer, or workman of any ſort, ſhall come as a ſtranger into any town, and aſk employment, the perſon who employs him ſhall firſt demand a ſight of his medal, take a copy of its inſcription, and by the firſt poſt ſend a letter of advice to the officers of the pariſh he came from. And in neglect or contempt of ſuch advice, he ſhall be liable to a penalty ſufficient to compel its ſtrict obſervance.

Upon this plan, ſhould any ſervant, day-labourer, or workman of any ſort, abſcond from his place of abode for any miſdemeanor, or treſpaſs he had committed, he could not proceed many days unapprehended; for no perſon ſhould be ſuffered to entertain a ſtranger above one night, without taking a copy of his medal, and ſending advice to his pariſh. A man could not then run away, deſert his family, and throw them as a burden on the pariſh, becauſe detection would immediately purſue him, bring him back in diſgrace, and inflict an adequate puniſhment upon him.

Were ſuch a plan to be proſecuted with vigour, it would be a ſufficient bar to every attempt of thievery and roguery, for impunity in which, the delinquent ultimately depended upon deſertion. No man, in his ſenſes, could depend upon a means for his ſecurity, in which he knew before-hand it would

would be impoſſible for him to ſucceed. Deſertion is the dernier reſort of every villain. When he finds himſelf ſuſpected, he inſtantly runs his country, and endeavours to ſecrete himſelf at a diſtance, in places to which, as he imagines, ſuſpicion is leaſt likely to purſue him. But under this regulation, whether could he fly? Let it be whither you pleaſe, if he produces his medal, it betrays him; if he does not, it raiſes a ſuſpicion which juſtifies his detention, till he is fairly cleared of all ſuſpicion.

As this plan would operate beneficially, in the detection and prevention of villainy, it would ſometimes prove no leſs uſeful to the honeſt, but unfortunate man. Innocent men have been ſometimes apprehended for ſpies, for highwaymen, and other atrocious crimes, from a ſimilarity of circumſtances, which it was not in their power to avoid. A highwayman, well mounted on a grey horſe, ſome years ſince, robbed in the neighbourhood of London. Soon after, a perſon from a diſtant county happened to paſs the road on a good horſe of the ſame colour. Some perſons took the alarm, purſued him, and took him into cuſtody. As he was innocent, he came to no harm, but that of being detained all night, and the trouble he was put to, of proving he was not the man ſuſpected, which he could do no otherwiſe, than by proving who he was; which, in many caſes, where a man is totally unknown,

known, might be attended with much trouble and vexation.

I by no means offer this, as a well digeſted plan competent to the accompliſhment of the intended purpoſe; but as the outlines of a ſcheme, which I am well convinced, by a perſon of abilities, might be made perfectly adequate to every purpoſe propoſed.

I will beg leave to make one obſervation more, before I have done.

In a fertile country like England, which grows more corn than its inhabitants can conſume, and, of courſe, renders it a commercial article; it is of great importance to aſcertain the following facts, for the regulation of the exportation of that article.

I. What is the annual average growth of corn in England for a ſeries of years?

II. What is the annual average conſumption for the ſame time?

Theſe being known, it would appear, what is the annual ſurplus, and conſequently, how much might be exported annually, conſiſtently with the ſafety and well being of the people. This is a queſtion of the greateſt importance to this country; a queſtion, the ignorance of which has coſt this nation millions, and by which our ſagacious neighbours, the Dutch, have profited millions. Though totally neglected, I conceive it might be aſcertained with no great difficulty or trouble

trouble to any body. But this is a matter of too much conſequence and extent, to be explained in a curſory paper.

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## *On the* PLEASURE *which the* MIND *in many Caſes receives from* CONTEMPLATING SCENES *of* DISTRESS. *By* T. BARNES, D. D. *Read April* 3, 1782.

Suave mari magno, turbantibus æquora ventis,
E terrâ alterius magnum ſpectare periclum.
Non quia vexari quenquam eſt jucunda voluptas;
Sed quibus ipſe malis careas, quia cernere ſuave eſt.

LUCRETIUS.

THE pleaſure deſcribed by the Poet in this motto, and of which he has mentioned ſo ſtriking and appoſite an inſtance, may perhaps, at firſt, ſeem of ſo ſingular and aſtoniſhing a nature, that ſome may be diſpoſed to doubt of its exiſtence. But that it does exiſt, in the caſe here referred to, and in many others, of a ſimilar kind, is an undoubted fact: and it may not appear an uſeleſs, or diſagreeable entertainment, to trace its *ſource* in the human breaſt, together with the *final cauſe*, for which it was implanted there by our benevolent Creator.

"Shall I, it may be ſaid, feel complacency in beholding a ſcene, in which many of my fellow-creatures

*Fig: 1*

♃

JUPITER

*Tin*

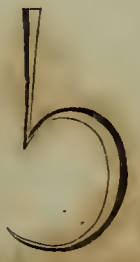
*Fig: 2.*

♀

VENUS

*Copper*

*Fig: 3.*



♄

SATURN

*Lead*

*Fig: 4.*

♂

MARS

*Iron*

*Fig: 5.*

☿

MERCURY

*Quicksilver*

*Published as the Act directs. Sept^r 29^th 1789 by T. Cadell in the Strand.*

*Neele sculp^t Strand*

creatures are agonizing with terror, whilſt I can neither diminiſh their danger, nor, by my ſympathy, divide their anguiſh? At the ſight of another's woe, does not my boſom naturally feel pain? Do I not ſhare in his ſenſations? And is not this ſtrong and exquiſite ſenſibility intended by my Maker, to urge me on to active, and immediate aſſiſtance? Theſe ſenſations are indeed attended with a noble pleaſure, when I can, by friendly attention, or by benevolent communication, ſooth the ſorrows of the poor mourner, ſnatch him from impending danger, or ſupply his preſſing wants. But, in general, where my ſympathy is of no avail to the wretched ſufferer, I fly from the ſpectacle of his miſery, unable, or unwilling to endure a pain, which is not allayed by the ſweet ſatisfaction of doing good."

It will be incumbent on us, in anſwer to theſe objections, in the firſt place, to prove the *reality* of the feeling, the cauſe of which, in the human conſtitution, we here attempt to explore.

Mr. Addiſon, in his beautiful papers on the Pleaſures of the Imagination,* has obſerved, "that objects or ſcenes, which, when *real*, gave diſguſt or pain, in *deſcription*, often become beautiful and agreeable. Thus, even a dunghill may, by the charms of poetic imagery, excite pleaſure and entertainment. Scenes of this nature, dignified

* Spectator, ſixth volume, No. 418.

by apt and ſtriking deſcription, we regard with ſomething of the ſame feelings, with which we look upon a dead monſter.

> - - - - - - - - - - - - - - Informe cadaver
> Protrahitur: nequeunt expleri corda tuendo
> Terribiles oculos, vultum, villoſaque ſetis
> Pectora ſemiferi, atque extinctos faucibus ignes.
>
> VIRGIL.

"This, he obſerves, is more particularly the caſe, where the deſcription raiſes a *ferment* in the mind, and works with violence upon the paſſions. One would wonder, adds he, how it comes to paſs, that paſſions, which are very *unpleaſant* at all other times, are very *agreeable*, when excited by proper deſcription; ſuch as terror, dejection, grief, &c. This pleaſure ariſes from the reflection we make upon ourſelves, whilſt reading it, that we are not in danger from them. When we read of wounds, death, &c. our pleaſure does not riſe ſo properly, from the *grief*, which theſe melancholy deſcriptions give us, as from the ſecret *compariſon* we make of ourſelves, with thoſe who ſuffer. We ſhould not feel the *ſame kind* of pleaſure, if we *actually ſaw* a perſon lying under the tortures, that we meet with in a deſcription."

And yet, upon the principle aſſigned by this amiable writer, we might feel the ſame, or even higher pleaſure, from the *actual* view of diſtreſs, than

than from any *deſcription*; becauſe the compariſon of ourſelves with the ſufferer would be more vivid, and conſequently, the feeling more intenſe. I would only obſerve, that the cauſe which he aſſigns for this pleaſure, is the very ſame with that aſſigned by Lucretius, in our motto. Mr. Addiſon applies it to the *deſcription*; the Poet, to the *actual contemplation*, of affecting ſcenes. In both, the pleaſure is ſuppoſed to originate in *ſelfiſhneſs*. But, wherever the ſocial paſſions are deeply intereſted, as they are here ſuppoſed to be, from the pathetic *deſcription*, or the ſtill *more* pathetic *ſurvey*, of the ſufferings of another, the ſympathetic feelings will, of themſelves, at once, and previous to all reflection, become a ſource of agreeable and tender emotions. They will thus dignify and enhance the ſatisfaction, if any ſuch be felt, ariſing merely from the conſideration of our own perſonal ſecurity. And the more entirely we enter into the ſcene, by loſing all ideas of its being either paſt, or fabulous, the more perfectly we forget ourſelves, and are abſorbed in the feeling,—the more exquiſite is the ſenſation.

But, as our ſubſequent ſpeculations will chiefly turn upon the pleaſure derived from *real* ſcenes of calamity, and not from thoſe which are *imaginary*, it may be expected, that we adduce inſtances, in *proof*, that ſuch pleaſure is *felt*, by perſons very different in their taſte, and mental cultivation.

I will not mention the horrid joy, with which the savage feasts his eye upon the agonies and contortions of his expiring prisoner—expiring in all the pangs which artificial cruelty can inflict! Nor will I turn your eye to the almost equally savage sons of antient Rome, when the majesty of the Roman people could rush, with eagerness and transport, to behold hundreds of *Gladiators* contending in fatal conflict, and, probably, more than half the number extended, weltering in blood, and writhing in agony, upon the plain. Nor will I mention the Spanish Bull-Feasts; nor the fervent acclamations of an English Mob around their fellow-creatures, when engaged in furious battle, in which it is possible, that some of the combatants may receive a mortal blow, and be hurried, dreadful thought! in this awful state, to the bar of his Judge.

Let us survey the multitudes, which, in every part of the kingdom, always attend an *execution*. It may perhaps be said, that, in all places, the vulgar have little of the sensibility and tenderness of more polished bosoms. But, in the last-mentioned instance, an execution, there is no exultation in the sufferings of the poor criminal. He is regarded by every eye, with the most melting compassion. The whole assembly sympathizes with him, in his unhappy situation. An awful stillness prevails, at the dreadful moment. Many are wrung with unutterable sensations:

ſenſations: and prayer and ſilence declare, more loudly than any language could, the intereſt they feel in his diſtreſs. Should a reprieve come to reſcue him from death, how great is the general triumph and congratulation! And, probably, in this multitude you will find, not the mere vulgar herd alone, but the man of ſuperior knowledge, and of more refined ſenſibility; who, led by *ſome* ſtrong principle, which we wiſh to explain, feels a pleaſure greater than all the pain, great and exquiſite as one ſhould imagine it to be, from ſuch a ſpectacle.

The man who condemns many of the ſcenes we have already mentioned, as barbarous and ſhocking, would, probably, run with the greateſt eagerneſs to ſome high cliff, overhanging the ocean, to ſee it ſwelled into tempeſt, though a poor veſſel, or even a fleet of veſſels, were to appear as one part of the dreadful ſcenery, now lifted to the heavens on the foaming ſurge, now plunged deep into the fathomleſs abyſs, and now daſhed upon the rocks, where they are, in a moment, ſhivered into fragments, and, with all their mariners, entombed in the wave. Or, to vary the queſtion a little; Who would not be forward to ſtand ſafe, on the top of ſome mountain or tower, adjoining to a field of battle, in which two armies meet in deſperate conflict, though, probably, thouſands may ſoon lie before him proſtrate on the ground, and the whole field

preſent the moſt horrid ſcenes of carnage and deſolation?

That, in all theſe caſes, pleaſure predominates in the compounded feeling, is plain from hence, becauſe you *continue* to ſurvey the ſcene; whereas, when pain became the ſtronger ſenſation, you would certainly *retire*. I was lately in company with a Gentleman, who deſcribed to me, in very glowing and pictureſque colours, an engagement between two privateers, of which he had been a ſpectator, from one of the cliffs on the eaſtern coaſt of England. Several lives were loſt; and the conteſt was long, doubtful, and ſevere. Having this ſubject in my thoughts, I aſked him, whether he felt *pleaſure* from the ſpectacle. He anſwered with great energy, that he would not have miſſed the ſight for a very conſiderable ſum. His tone, and manner proved, that he ſpoke from his heart.

Cultivation may, indeed, have produced ſome minuter differences, in the taſte and feelings of different minds. Thoſe, whoſe ſenſibilites have not been refined by education or ſcience, may feel the pleaſure, in a more groſs and brutal form. But do not the moſt poliſhed natures feel a ſimilar, a *kindred* pleaſure, in the deep-wrought diſtreſſes of the well-imagined ſcene? Here the endeavour is, to introduce whatever is dreadful or pathetic, whatever can harrow up the feelings, or extort the tear. And the deeper, and more tragical

tragical the ſcene becomes, the more it agitates the ſeveral paſſions of terror, grief, or pity—the more intenſely it delights, even the moſt poliſhed minds. They ſeem to enjoy the various and vivid emotions of contending paſſions. They love to have the tear trembling in the eye, and to feel the whole ſoul rapt in thrilling ſenſations. For that moment, they ſeem to forget the fiction; and *afterwards* commend that exhibition moſt, in which they moſt entirely loſt ſight of the author, and of their own ſituation, and were alive to all the unutterable vibrations of ſtrong or melting ſenſibility.

Taking it, then, for granted, that in the contemplation of *many* ſcenes of diſtreſs, both imaginary and real, a gratification is felt, let us endeavour to account for it, by mentioning ſome of thoſe principles, woven into the web of human nature, by its benevolent Creator, on which that gratification depends.

Dr. Akenſide, with his accuſtomed ſtrength and brilliancy of colouring, *deſcribes*, and *accounts for* it, in the following manner. I will make no apology for the length of the quotation.

---------- "Behold the ways
Of heaven's eternal deſtiny to man!
For even juſt, benevolent, and wiſe!
That VIRTUE's awful ſteps, howe'er purſued
By vexing fortune, and intruſive pain,
Should never be divided from her chaſt,
Her fair attendant, PLEASURE. Need I urge

Thy tardy thought, through all the various round
Of this existence, that thy softening soul
At length may learn, what *energy* the hand
Of VIRTUE mingles in the bitter tide
Of PASSION, swelling with distress and pain,
To mitigate the sharp, with gracious drops
Of cordial PLEASURE. Ask the faithful youth,
Why the cold urn of her, whom long he loved,
So often fills his arm? So often draws
His lonely footsteps, at the silent hour,
To pay the mournful tribute of his tears?
O! he will tell thee, that the wealth of worlds
Should ne'er seduce his bosom to forego
That sacred hour, when, stealing from the noise
Of care and envy, *sweet remembrance* sooths,
With virtue's kindest looks, his aching breast,
And turns his *tears* to *rapture*. Ask the croud,
Which flies impatient from the village-walk
To climb the neighbouring cliffs, when far below
The cruel winds have hurled upon the coast
Some helpless bark: whilst sacred pity melts
The general eye, or Terror's icy hand
Smites their distorted limbs, or horrent hair,
While every mother closer to her breast
Catches her child; and, pointing where the waves
Foam through the shattered vessel, shrieks aloud,
As one poor wretch, that spreads his piteous arms
For succour, swallowed by the roaring surge,
As now another, dashed against the rock,
Drops lifeless down. O deemest thou indeed
No KIND ENDEARMENT HERE, by nature given,
To mutual *terror*, and compassion's *tears*?
No sweetly melting softness, which attracts
O'er all that edge of pain, the social powers,
To this their proper action, and their end?"

The

The Poet purſues the ſentiment in the ſame animated imagery, deſcribing the ſtrong, but pleaſurable ſenſations, which the ſoul feels, in reading the ſufferings of heroes, who nobly died in the cauſe of liberty, and their country:

---------- "When the pious band
Of youths, who fought for freedom, and their ſires,
Lie ſide by ſide in gore."

Or, in the ſtrong movements of indignation and revenge againſt the tyrant, who invades that liberty, and enſlaves that country.

---------- "When the patriot's tear
Starts from thine eye, and thy extended arm
In fancy hurls the thunderbolt of Jove,
To fire the impious wreath on Philip's brow,
Or daſh Octavius from his trophied car;
Say—Does thy ſecret ſoul *repine* to taſte
The big *diſtreſs?* Or, would'ſt thou then exchange
Thoſe *heart-ennobling ſorrows* for the lot
Of him, who ſits amid the gaudy herd
Of mute barbarians, bending to his nod,
And bears aloft his gold-inveſted front,
And ſays within himſelf," "I am a King,
And wherefore ſhould the clamorous voice of woe
Intrude upon mine ear?"

The ſentiment of this charming and moral poet is, that ſympathetic feelings are *virtuous*, and therefore *pleaſant*. And from the whole, he deduces this important concluſion; that every virtuous emotion muſt be agreeable, and that this is the *ſanction*, and the *reward* of virtue. The thought

thought is amiable. The concluſion noble. But ſtill the ſolution appears to me to be imperfect.

We have already ſaid, that the pleaſure ariſing from the contemplation of diſtreſsful ſcenes is a *compounded feeling*, ariſing from *ſeveral* diſtinct ſources in the human breaſt. The *kind* and *degree* of the ſenſation muſt depend upon the various blendings of the ſeveral ingredients, which enter into the compoſition. The cauſe aſſigned by Mr. Addiſon, the ſenſe of our own ſecurity, may be ſuppoſed to have *ſome* ſhare in the maſs of feelings. That of Dr. Akenſide may be allowed to have a ſtill *larger* proportion:—Let us attempt to trace ſome of the reſt.

There are few principles in human nature of more general and important influence, than that of SYMPATHY. A late ingenious writer, led by the faſhionable idea of ſimplifying all the ſprings of human nature into *one* ſource, has, in his beautiful Theory of Moral Sentiments, endeavoured to analyſe a very large number of the feelings of the heart into ſympathetic vibration. Though it appears to me moſt probable, that the human mind, like the human body, poſſeſſes *various* and *diſtinct* ſprings, of action and of happineſs, yet he has ſhewn, in an amazing diverſity of inſtances, the operation and importance of this principle of human nature. Let us apply it to our preſent ſubject.

We

We naturally ſympathize with the paſſions of others. But, if the paſſions they appear to feel be not thoſe of *mere diſtreſs alone*; if, amidſt ſcenes of calamity, they diſplay fortitude, generoſity, and forgiveneſs; if, "riſing ſuperior to the cloud of ills which covers them," they nobly ſtand firm, collected, and patient; here, a ſtill higher ſource of pleaſure opens upon us, from complacence, admiration, and that unutterable ſympathy, which the heart feels with virtuous and heroic minds. By the operation of this principle, we place ourſelves in their ſituation; we feel, as it were, ſome ſhare of that conſcious integrity and peace, which they muſt enjoy. Hence, as before obſerved, the pleaſure will vary, both as to its *nature*, and *degree*, according to the *ſcene* and *characters* before us. The ſhock of contending armies in the field,—the ocean wrought to tempeſt, and covered with the wreck of ſhattered veſſels,—and a worthy family ſilently, yet nobly bearing up, againſt a multitude of ſurrounding ſorrows, will excite very *different* emotions, becauſe the component parts of the pleaſurable ſenſation conſiſt of very different materials. They all excite admiration; but admiration, how diverſified, both as to its *degree*, and its *cauſe!* Theſe ſeveral ingredients may, doubtleſs, be ſo blended together, that the pleaſure ſhall make but a very ſmall part of the mixed ſenſation. The more agreeable *tints* may bear

little

little proportion to the terrifying *red*, or the gloomy *black*.

In many of the inſtances which have been mentioned, the pleaſure muſt ariſe chiefly, if not ſolely, from the *circumſtances*, or *accompanyments* of the ſcene. The ſublime feelings, excited by the view of an agitated ocean, relieve and ſoften thoſe occaſioned by the ſhipwreck. And the awe, excited by the preſence of thouſands of men, acting as with one ſoul, and diſplaying magnanimity and firmneſs, in the moſt ſolemn trial, tempers thoſe ſenſations of horror and of pain, which would ariſe from the field of battle.

The gratification we are attempting to account for, depends alſo, in a very conſiderable degree, upon a principle of human nature, implanted in it for the wiſeſt ends; the EXERCISE which it gives to the mind, by rouſing it to energy, and feeling. Nothing is ſo inſupportable, as that languor and *ennui*, for the full expreſſion of which, our language does not afford a term. How agreeable it is, to have the ſoul called forth to exertion and ſenſibility, let the Gameſter witneſs, who, unable to endure the laſſitude and ſameneſs of unanimated luxury, runs with eagerneſs to the place, where probably, await him all the irritation and agony of tumultuous paſſions.

Again; It is a law of our nature, That *oppoſite paſſions*, when felt in *ſucceſſion*, and, above all,

all, when felt at the *ſame moment*, heighten and increaſe each other. Eaſe ſucceeding pain, certainty after ſuſpenſe, friendſhip after averſion, are unſpeakably ſtronger, than if they had not been thus contraſted. In this *conflict* of feelings, the mind riſes from *paſſive* to *active* energy. It is rouſed to intenſe ſenſation; and it enjoys that peculiar, exquiſite, and complex feeling, in which, as in many articles of our table, the acid and the ſweet, the pleaſurable and painful pungencies are ſo happily mixed together, as to render the united ſenſation amazingly more ſtrong and delightful.

We have not yet mentioned the principle of CURIOSITY, that buſy and active power, which appears ſo *early*, continues almoſt unimpaired ſo *long*, and to which, for the wiſeſt ends, is annexed ſo great a ſenſe of enjoyment. To this principle, rather than to a love of cruelty, would I aſcribe that pleaſure, which children ſometimes ſeem to feel, from torturing flies, and leſſer animals. They have not yet formed an idea of the pain they inflict. It is, indeed, of unſpeakable conſequence, that this practice be checked, as ſoon and as effectually as poſſible, becauſe it is ſo important, that they learn to connect the ideas of pleaſure and pain, with the motions and actions of the animal creation. And, to this principle may we alſo refer, no ſmall ſhare of that pleaſure in the contemplation of diſtreſsful

ſcenes,

ſcenes, the ſprings of which, in the human heart, we are now endeavouring to open.

To CURIOSITY, then—to SYMPATHY—to MENTAL EXERTION—to the idea of our own SECURITY—and to the STRONG FEELINGS occaſioned by viewing the *actions* and *paſſions* of mankind in INTERESTING SITUATIONS, do we aſcribe that *gratification*, which the mind feels from the ſurvey of many ſcenes of ſorrow. We have called it a PLEASURE; but it will approach towards, or recede from *pleaſure*, according to the *nature*, and *proportion* of the ingredients, of which the ſenſation is compoſed. In *ſome* caſes, pain will predominate. In OTHERS, there will be exquiſite enjoyment.

The *final cauſe* of this conſtitution of the human mind is probably, that by means of this ſtrong ſenſation, the ſoul may be preſerved in continual and vigorous motion—that its feelings may be kept lively and tender—that it may learn, to practiſe the virtues it admires—and to aſſiſt thoſe to whom its ſympathy *can* reach—and that it may thus be led, by theſe ſocial exerciſes of the heart, to ſoften with compaſſion—to expand with benevolence—and generouſly to aſſiſt in every caſe, in which aſſiſtance can be given. An end this ſufficient,

------ "To aſſert eternal Providence,
And juſtify the ways of God to man."

OBSERVA-

## OBSERVATIONS *on* BLINDNESS, *and on the Employment of the other Senſes to ſupply the* LOSS *of* SIGHT. *By Mr.* BEW. *Read April* 17, 1782.

> -------- tenebraſque neceſſe 'ſt
> Non radii ſolis, neque lucida tela diei
> Diſcutiant---- LUCRET.

AMONGST the various accidents and calamities, to which the human ſpecies are ſubjected, there are none that excite compaſſion, or call forth our benevolent aid more powerfully, than blindleſs. The blind man, in all ages and countries, has ever been allowed an indiſputable claim on the good offices of his fellow-creatures; his neceſſities have generally been ſupplied with ſacred care; and his genius, if it approached to excellence, has been reſpected with a degree of reverence, ſuperior to what is uſually beſtowed, on ſuch as are poſſeſſed of the faculty of ſight.

The faculty of ſight, indeed, is juſtly conſidered as ſuperior to any of the other ſenſes. Hearing, taſting, and ſmelling, when compared with viſion, appear very limited in their powers and determinations; and though the ſenſe of touch may poſſeſs the moſt general, and accurate power of conveying the ideas of the various modifications

tions of matter to the mind; yet the comprehenſiveneſs, together with the inſtantaneous celerity, with which viſion diſplays to us the wonders of Nature, or the varieties of Art, far tranſcend any of the perceptions, that the touch, or the other ſenſes are able to furniſh us with. It is, perhaps, on this account, that we figuratively employ the term, *ſeeing*, in acknowledging the conſcious evidence of reaſon and truth; and even extend the application, as the moſt expreſſive, to one of the diſtinguiſhing attributes of Almighty perfection.

In no part of the human fabric, or even throughout the whole of nature, with which we are acquainted, are there more evident marks of exquiſite perfection and wiſdom, than in what relates to the ſenſe of ſeeing; whether we direct our attention to the wonderful regularity, order, minuteneſs, and velocity of the rays of light, which miniſter to this ſenſe, or to the ſtructure and formation of the little organ, in which this faculty is deſtined to reſide. "With a ball and "ſocket, (as a learned and elegant Philoſopher,* "beautifully obſerves) of an inch diameter, we "are enabled, in an inſtant of time, without "changing our place, to perceive the diſpoſition "of an army, the figure of a palace, and the "variety of a landſcape;" and not only, as he farther remarks, to "find our way through the

* Dr. Reid, p. 121.

"pathleſs

" pathleſs ocean, traverſe the globe of the earth,
" determine its figure and dimenſions, and deli-
" neate every region of it :" But,

------ " Breaking hence, take our ardent flight
" Thro' the blue infinite,"

aſcertain the order, revolutions and diſtances of the planetary orbs, and even form probable conjectures on

---------- " Every ſtar
" Which the clear concave of a winter's night
" Pours on the eye, or aſtronomic tube,
" Far ſtretching, ſnatches from the dark abyſs."

THOMSON.

In contemplating, therefore, the extenſive and almoſt unlimited properties of viſion, we not only find our gratitude warmed and elevated to piety and devotion, but are, likewiſe, conſcious of an involuntary impulſe, that urges us to exert our endeavours, towards the aſſiſtance of ſuch as are unfortunately deprived of this noble faculty, whenever they are preſented to our notice.

And here, again, we have every motive to inſpire us with admiration of the providential wiſdom and benevolence, diſplayed by the divine Author of our exiſtence. For, notwithſtanding the great and comprehenſive powers of ſight, there is little of the actual knowledge acquired

by this faculty, that may not, by attentive and patient perſeverance, be communicated to the man who has been doomed to darkneſs from his birth. The bigot, or the enthuſiaſt, who condemns the reſearches of philoſophy, and erroneouſly pronounces them to be incompatible with religion; perceives, with aſtoniſhment, the blind enabled to expatiate on light or colours; on reflection, refraction, and on the various ſubjects, from which we might naturally ſuppoſe they would be excluded, by the deprivation of ſight; and ſatisfies himſelf with abruptly referring the whole to the immediate diſpenſation of the Deity. The philoſopher, on the other hand, though, with willing ſubmiſſion, he ultimately attributes the effects to Omnipotence; is, nevertheleſs, deſirous to avoid the cenſure paſſed on the ſervant, "*who buried his talent in a napkin*;" and ventures to exert the abilities with which he may be endowed in endeavouring to inveſtigate the means by which the effects are ordained to be accompliſhed, to the end, that the intereſts of humanity may be ſerved with greater certainty.

The powerful influence of exerciſe and habit upon the intellectual, as well as upon the corporeal faculties, are too well known and acknowledged, to require much illuſtration. The muſcles, of any part of the body, acquire peculiar vigour and fullneſs by habitual exerciſe;

ciſe; and the ſame is remarkable, though in a ſtill higher degree, with reſpect to the effects of exerciſe and habit, on the faculties of the mind. From this wiſe regulation, in the œconomy of nature, reſults a train of reſources, which the blind are found capable of deriving, from the exerciſe of the other ſenſes; and which may be ſo far perfected, as to compenſate, in a great meaſure, for the loſs of the darling ſenſe of ſight. The delicacy and preciſion, with which ſome eminent blind people have employed the other ſenſes, particularly *hearing* and *touch*, would, indeed, exceed the bounds of credibility, were we not aſſured of the facts, as well from actual experience, as from undoubted authorities.

Dr. Saunderſon loſt his ſight, by the ſmall-pox, ſo early in his infancy, that he did not remember to have ever ſeen. He had no more ideas of light, than if he had been born blind. Notwithſtanding this misfortune, he acquired ſuch profound and perfect knowledge in the ſcience of mathematics, that, by the influence of his merit only, he was appointed to the profeſſorſhip in the Univerſity of Cambridge. The addreſs of this celebrated philoſopher, was no ways inferior to the knowledge he poſſeſſed; a circumſtance, which we do not always meet with in thoſe who have the full powers of ſight. His lectures on the different branches of mathematics, natural philoſophy, aſtronomy,

and optics, were remarkably clear and intelligible. Fully aware of the difficulties young minds have to contend with, from the abſtruſeneſs in which the ſubjects of natural philoſophy are uſually involved, his endeavours were ſucceſsfully directed to obviate and remove theſe obſtructions; and to furniſh a method, at the ſame time, comprehenſive, natural, and eaſy to be underſtood.

Dr. Saunderſon's ſenſation of touch, as is uſual with blind people, was very exquiſite; and it was by means of this ſenſe, that he acquired many of his principal ideas. He diſtinguiſhed, with aſtoniſhing nicety, the peculiar properties of bodies, that depended on the roughneſs or ſmoothneſs of their ſurfaces. A remarkable inſtance is given of his nice accuracy in this reſpect. A ſeries of Roman medals, ſome of which were true, and others falſe, were preſented to his touch. Dr. Saunderſon, by running his fingers over them, was ſoon able to diſtinguiſh the genuine antiques, from thoſe that were counterfeited; though the latter had been executed, with ſuch exactneſs of imitation, as to deceive a connoiſſeur, who only judged by the eye. But, ſays the profeſſor, "I, who had not that ſenſe "to truſt to, could eaſily feel a roughneſs in the "new caſt, ſufficient to diſtinguiſh them by."

The impreſſion made by the approach of bodies nearer to him, or their being removed farther

farther off; and the different ſtates of the atmoſphere, were diſtinguiſhable to him by the ſame delicate ſenſe of touch; and his ſenſe of hearing was refined to a ſimilar degree of perfection. He could readily aſcertain the fifth part of a note of muſic. He not only diſtinguiſhed and remembered the different people he converſed with, by the peculiar ſounds of their voices, but, in ſome meaſure, places alſo. Judging by the ſounds of the pavements, of the courts and piazzas, and the reflection of theſe ſounds from the walls, he remembered the different variations, ſo as to be able to recollect the places, pretty exactly, when conducted to them afterwards.

We might produce a great variety of inſtances, both antient and modern, where blind perſons have excelled in different departments of ſcience; and particularly, in the ſeveral branches of mathematics. * But the attachment, which theſe unfortunate

* Diodotus, the preceptor of Cicero, is repreſented as attaching himſelf, with greater aſſiduity to the Science of Mathematics after he became blind.

" Diodotus Stoicus, cæcus multos annos, noſtræ domi " vixit: is vero, quod credibile vix eſſet, cum in Philo- " ſophia multô etiam magis aſſiduè quam antea verſaretur " tum quod ſine occulis fieri poſſit. Geometriæ munus tueba- " tur, precipiens diſcentibus, unde, quo, quamque lineam " ſcriberent." Cic. Tuſc. diſp. L. V. 39.

unfortunate people diſplay, for the pleaſing purſuits of muſic and poetry, is ſtill more general. The powerful influence of verbal expreſſion, when communicated to the blind, in the form of poetry, and the congenial ideas it inſpires, are really aſtoniſhing. Of this we have a recent proof in Dr. Blacklock of Edinburgh. This amiable gentleman was, I believe, either born blind, or became ſo very ſoon after his birth: yet, we find no defects, in thoſe beautiful poems he has exhibited to the world, that can be attributed to his want of ſight; on the contrary, we meet with deſcriptions of viſual ſcenes and objects, as beautiful, expreſſive, and juſt, as if he had actually been poſſeſſed of the faculty of ſeeing; and had drawn his deſcriptions, from an enraptured ſurvey of the variegated proſpects of nature. Whereas, we muſt be convinced, when we accurately conſider the matter, that the poetic enthuſiaſm, which inſpired him, and excited theſe imitative powers, could only be produced by the various combination of ſounds, which were conveyed, by words, to his imagination.

The influence of muſic is ſtill more generally to be obſerved than that of poetry. Muſic, almoſt

Didymus of Alexandria, is celebrated by St. Jerom and the hiſtorian Caſſiodorus, as a prodigy in logic and mathematics, though blind from his infancy. The latter writer, likewiſe ſpeaks of one Euſebius, an Aſiatic, who, though blind, diſtinguiſhed himſelf highly in all kinds of learning.

without

without exception, appears to be the favourite amuſement of the blind. There is no other employment of the mind, religious contemplation excepted, that ſeems ſo well adapted to ſooth the ſoul, and diſſipate the melancholy ideas, which, it may naturally be expected, will ſometimes pervade the diſpoſitions of thoſe who are utterly bereft of ſight. This, together with the beneficial influence that reſults from the practice of this delightful art, by quickening and perfecting the ſenſe of hearing, is a matter that deſerves the moſt ſerious attention. The celebrated Profeſſor, juſt now-mentioned, excelled in performing on the flute, in his youth; and the refinement of his ear, has been very juſtly attributed to his early attention to muſic. It is not, therefore, ſurprizing that ſo many blind people have diſtinguiſhed themſelves in this ſcience. Stanley and Parry were deprived of their ſight in early infancy; yet both theſe Gentlemen have diſplayed extraordinary proofs of their abilities, not only as compoſers and performers of muſic, but, likewiſe, in matters that, at a firſt view, we might be apt to conſider as peculiar to thoſe who are fully poſſeſſed of the faculty of viſion. Their ſeparate reputations, as muſicians, are ſufficiently known and acknowledged. The ſtile of Stanley is truly his own; and his execution on the organ, equal, if not ſuperior to any of his cotemporary performers on that grand inſtrument. Parry may

be revered as the Britiſh bard of modern times. The halls of the Cambrian Chief reſound with the melodious vibrations of his harp, and he has united the refinements of taſte and elegance to the rude, but expreſſive modulations of antiquity.

I paſs over a number of inſtances, that might be offered to your notice, and proceed to give ſome account of Dr. Henry Moyes, the elegant reader on philoſophical chemiſtry; whoſe lectures, the greateſt part of this ſociety had the ſatisfaction of attending, and whoſe perſonal acquaintance ſeveral of us have enjoyed.

This intelligent philoſopher, like the celebrated profeſſor of Cambridge before-mentioned, loſt his ſight, by the ſmall-pox, in his early infancy. He never recollected to have ſeen: "but "the firſt traces of memory I have," ſays he, "are "in ſome confuſed ideas of the ſolar ſyſtem." He had the good fortune to be born in a country where learning of every kind is highly cultivated, and to be brought up in a family devoted to learning.

Poſſeſſed of native genius, and ardent in his application, he made rapid advances in various departments of erudition; and not only acquired the fundamental principles of mechanics, muſic, and the languages; but, likewiſe entered deeply into the inveſtigation of the profounder ſciences; and diſplayed an acute and

and general knowledge of geometry, optics, algebra; of aſtronomy, chemiſtry; and, in ſhort, of moſt of the branches of the Newtonian philoſophy.

Mechanical exerciſes were the favourite employments of his infant years. At a very early age, he made himſelf acquainted with the uſe of edged tools, ſo perfectly, that, notwithſtanding his intire blindneſs, he was able to make little wind-mills; and, he even conſtructed a loom, with his own hands, which ſtill ſhew the cicatrices of wounds, he received in the execution of theſe juvenile exploits.

By a moſt agreeable intimacy, and frequent intercourſe, which I enjoyed, with this accompliſhed blind Gentleman, whilſt he reſided in Mancheſter; I had an opportunity of repeatedly obſerving the peculiar manner, in which he arranged his ideas, and acquired his information. Whenever he was introduced into company, I remarked, that he continued ſome time ſilent. The ſound directed him to judge of the dimenſions of the room, and the different voices, of the number of perſons that were preſent. His diſtinction, in theſe reſpects, was very accurate; and his memory ſo retentive, that he ſeldom was miſtaken. I have known him inſtantly recognize a perſon, on firſt hearing him ſpeak, though more than two years had elapſed ſince the time of their laſt meeting. He determined, pretty nearly, the

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ſtature of thoſe he was ſpeaking with, by the direction of their voices; and he made tolerable conjectures, reſpecting their tempers and diſpoſitions, by the manner in which they conducted their converſation.

It muſt be obſerved, that this Gentleman's eyes were not totally inſenſible to intenſe light. The rays refracted through a priſm, when ſufficiently vivid, produced certain diſtinguiſhable effects on them. The red gave him a diſagreeable ſenſation, which he compared to the touch of a ſaw. As the colours declined in violence, the harſhneſs leſſened, until the green afforded a ſenſation that was highly pleaſing to him; and which he deſcribed, as conveying an idea ſimilar to what he felt, in running his hand over ſmooth poliſhed ſurfaces. Poliſhed ſurfaces, meandering ſtreams, and gentle declivities, were the figures, by which he expreſſed his ideas of beauty. Rugged rocks, irregular points, and boiſterous elements, furniſhed him with expreſſions for terror and diſguſt. He excelled in the charms of converſation; was happy in his alluſions to viſual objects; and diſcourſed on the nature, compoſition, and beauty of colours, with pertinence and preciſion.

Doctor Moyes was a ſtriking inſtance of the power, the human ſoul poſſeſſes, of finding reſources of ſatisfaction, even under the moſt rigorous calamities. Though involved "in ever during darkneſs,

darkneſs," and excluded from the charming views of ſilent or animated nature; though dependent on an undertaking for the means of his ſubſiſtence, the ſucceſs of which was very precarious; in ſhort, though deſtitute of other ſupport than his genius, and under the mercenary protection of a perſon, whoſe integrity he ſuſpected—ſtill Dr. Moyes was generally chearful and apparently happy. Indeed it muſt afford much pleaſure to the feeling heart to obſerve this hilarity of temper prevail, almoſt univerſally, with the blind. Though "cut off from the ways of men, and the contemplation of the human face divine;" they have this conſolation; they are exempt from the diſcernment, and contagious influence, of thoſe painful emotions of the ſoul, that are viſible on the countenance, and which hypocriſy itſelf can ſcarcely conceal. This diſpoſition, likewiſe, may be conſidered, as an internal evidence of the native worth of the human mind; that thus ſupports its dignity and chearfulneſs under one of the ſevereſt misfortunes that can poſſibly befall us. Nor is this chearful reſignation peculiar to thoſe who have been blind from their birth; we find it, alſo, generally prevail with ſuch as have loſt their ſight, even at a more advanced age; and who muſt, undoubtedly, feel the misfortune with the utmoſt anguiſh. The diſtreſſing recollection, which memory muſt preſent, of former enjoyments, we find, however,

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ſoon ſubſides. Gentler and more pleaſing reflections ſucceed. Contemplation takes her reſidence in her proper province, the human mind; and the blind, ſubmiſſively and chearfully reſign themſelves to the will of Heaven, and the benevolent protection of the leſs unfortunate of their fellow-creatures. And hard, indeed, is the heart of him, who will not ſtretch out his hand to ſuccour the blind; or who, by injuſtice, illiberality, or unkindneſs, adds a ſting to the conſcious dependence, to which, whilſt they live, they muſt ever be ſubjected.

The blind people I have hitherto ſelected to ſpeak of, it may be remarked, were ſuch as had their native faculties excited and matured by early and attentive education. But we ſhall find, even where education has been wanting, and the blind left, in a great meaſure, to the ſimple exertions of nature; that the natural faculties themſelves make ſurprizing efforts towards ſupplying the deficiency of ſight. I ſhall bring forwards to your notice a perſon, well known in this neighbourhood, of which he is a native. This is one John Metcalf, who, like the Gentlemen already mentioned, became blind at a very early age, ſo as to be intirely unconſcious of light and its various effects. This man paſſed the younger part of his life as a waggoner, and occaſionally, as a guide in intricate roads during the night, or when the tracks were covered with ſnow. Strange

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as this may appear to thoſe who can ſee, the employment he has ſince undertaken is ſtill more extraordinary: it is one of the laſt to which we could ſuppoſe a blind man would ever turn his attention. His preſent occupation is that of a projector and ſurveyor of highways in difficult and mountainous parts. With the aſſiſtance only of a long ſtaff, I have ſeveral times met this man traverſing the roads, aſcending precipices, exploring valleys, and inveſtigating their ſeveral extents, forms, and ſituations, ſo as to anſwer his deſigns in the beſt manner. The plans which he deſigns, and the eſtimates he makes, are done in a method peculiar to himſelf; and which he cannot well convey the meaning of to others. His abilities, in this reſpect, are, nevertheleſs, ſo great, that he finds conſtant employment. Moſt of the roads over the Peak in Derbyſhire, have been altered by his directions; particularly thoſe in the vicinity of Buxton: and he is, at this time, conſtructing a new one, betwixt Wilmſlow and Congleton, with a view to open a communication to the great London road, without being obliged to paſs over the mountains.*

Theſe

* Since this paper was written, and had the honour of being delivered to the Society, I have met this blind projector of the roads, who was alone as uſual; and amongſt other converſation, I made ſome inquiries reſpecting this new road. It was really aſtoniſhing to hear with what accuracy he deſcribed the courſes, and the nature of the different

Theſe inſtances will, I am perſuaded, be ſufficient to prove, how effectually, by proper exerciſe, the other ſenſes may be refined and perfected, ſo as, in many reſpects, to ſupply the loſs of ſight. The ſenſations of ſmell and taſte, indeed, are ſo very limited, that they do not ſeem capable of yielding many peculiar advantages to blind people: but the perceptions of hearing and touch, as we have ſeen, may be applied to purpoſes wonderfully extenſive.

By the nice diſtinction of touch and ſound, the blind man not only acquires knowledge with reſpect to perſons and ſituations; is not only warned from danger, and excited to pleaſure; but by means of theſe delicate faculties, he is enabled to conceive many of the viſual qualities of bodies, and to diſtinguiſh them with certain preciſion. I do not mean to infer, that a blind man annexes the ſame ideas to viſual qualities, as are excited in the minds of thoſe who are poſſeſſed of the perfect faculty of ſight. I only wiſh to obſerve, that he forms a general conception of their characters, by the analogy which he finds they bear to qualities he is ac-

different ſoils, through which it was conducted. Having mentioned to him a boggy piece of ground it paſſed through, he obſerved, that "that was the only place he had doubts "concerning; and that he was apprehenſive they had, "contrary to his directions, been too ſparing of their "materials."

quainted

quainted with, by means of his other ſenſes. Thus, for example, if we preſent a violet to him, and demand of him what ideas he has of its qualities; he will be able to anſwer with great preciſion reſpecting its ſmell, &c. which, as well as the name of the violet are ſoft, ſweet, and pleaſing. But, with regard to the colour, he will be wholly unable to conceive any idea of it, except what takes place from very diſtant analogies: the plaintive melody of the flute, the ſoft ſmoothneſs of ſurfaces, &c. In like manner, by appoſite aſſociations, he may compare the intenſe colour of ſcarlet to the glow of a furnace, the noiſe of a trumpet, or the odour of aromatics; becauſe they ſeverally affect his ſenſes with intenſe excitements.

But whatever amazing information, the ſenſes of hearing and touch, may afford the blind; theſe powers would, nevertheleſs, be tranſient and ineffectual, were not the impreſſions and ideas they excite in the mind, preſerved and matured by the aſſiſtance of the memory. It is chiefly by the aſſiſtance of the memory, that the blind acquire the exquiſite advantages, derived from the other ſenſes. In this reſpect, providential benevolence ſeems to have determined the greateſt compenſation, for the ſevere deprivation of the ſenſe of ſight. The ſoul of the blind man, undiſtracted by the never ceaſing variety which is always preſent to the organs of viſion, when awake,

awake, purſues its internal perceptions and contemplations with unconfounded ſerenity. The blind unlettered projector of roads could reply to me, when I expreſſed myſelf ſurprized at the accuracy of his diſcriminations, "that there was "nothing ſurprizing in the matter; You, Sir," ſays he, "can have recourſe to your eye ſight "whenever you want to ſee or examine any "thing; whereas, I have only my memory to "truſt to. There is one advantage, how-"ever," he remarked, that he poſſeſſed. "The "readineſs with which you view an object at "pleaſure, prevents the neceſſity of fixing "the ideas of it deeply in your mind, and the "impreſſions, in general, become quickly obli-"terated. On the contrary, the information I "poſſeſs, being acquired with greater difficulty, "is, on that very account, ſo firmly fixed on the "memory, as to be almoſt indelible." Such, indeed, is the wonderful influence, reſulting from the union of exerciſe and habit, on the faculties of the blind, that the permanency of their knowledge in a great meaſure, compenſates for the labour required in its attainment!

The inſtantaneous facility, with which, by the aid of ſight, we are able to aſcertain the peculiarities of any place we ſurvey, and the eaſe with which we review and recognize them, renders dependence on the memory, to us, leſs neceſſary. For inſtance, the dimenſions of the apartment

apartment I ſit in; the furniture, &c. will, by the organs of viſion, be immediately preſented to the mind of any ſtranger who may call on me, ſo that he will be able, in a moment, to recollect the whole whenever he repeats his viſit, to the ſame place. This kind of information can only be acquired by the blind man, in conſequence of the moſt patient attention. He is to be led round the ſeveral parts of the room, his finger conducted to the ſurfaces of the furniture, pictures, &c. before he can poſſibly form any idea with reſpect to the place. But when, by means of the perceptions of touch, and a neceſſary degree of information, he conceives a regular train of diſtinguiſhing ideas, his mind aſſociates them, with ſuch tenacity, that he ſeldom has occaſion to repeat his inquiries.

It is this accurate and retentive power of the memory, that enables the blind mathematician to make exact calculations and inferences; to work problems in algebra, and in infinite ſeries; to conceive, with preciſion, the different effects that bodies muſt produce to the ſight, by their being nearer or farther off; by their moving in a ſtraight or in an oblique line; and, that directs his inveſtigation with reſpect to the principles of projection, and the various rules of perſpective.

It muſt here be remarked, that though the blind man may conceive the properties of figure

and extenſion with certain accuracy; yet it does not follow that he would be able to diſtinguiſh them, with the ſame certainty, by viſion, provided that faculty were, immediately, beſtowed on him. On the contrary, the queſtion ſtarted by Mr. Molineux,* was found to prove exactly as that philoſopher expected, in the extraordinary caſe of a blind youth, whom Mr. Cheſelden had the good fortune to bring to ſight, by couching, at thirteen years of age. This young man, at his firſt feeling the impreſſions of objects on the organs of viſion, imagined every thing he ſaw touched his eyes; nor was he able to diſcriminate one object from another, however different their forms. When things that were before known to him, by touching, were preſented to him, he conſidered them attentively, in order to recognize them; but on a ſudden, he felt himſelf confuſed, from the multitude of objects that crowded for admiſſion, and the whole was involved in obſcurity. It appears, therefore, from the above fact, as well as from a due examination of the ſubject, that thoſe who make uſe of their eyes, for the firſt time, ſee only ſurfaces and colours; and have no conception of the viſible effects of light and projection, until they learn it from experience. In fact, if we carefully attend to the operation of our own minds, we ſhall find, that the

* Lock on the Underſtanding, vol. I. p. 107.

viſible

viſible appearances of objects are ſeldom accurately attended to, unleſs we are employed in delineating thoſe objects. The viſible appearance of things, is varied according to the direction of the light, the poſition, and the diſtance, with reſpect to the beholder: yet, as we are conſcious from experience, of the identity, the real figure is conceived in its actual proportion, and the viſible, or perſpective, appearance is conſidered only as a ſign or indication.

The accurate painter is well aware of this operation of the mind, and in delineating his objects, and relieving them with the diſtribution of light and ſhade, is carefully attentive to avoid forming concluſions, before he accurately conſiders the premiſes. The effect produced by a well managed picture, ſufficiently evinces the actual appearance of bodies, according to their point of view; and the impreſſions they muſt make on the organs of ſight, when employed previous to the influence of reaſon, and the correction of the judgment. The painter, who exerts the imitative powers of his art to deceive the eye, does not merely draw the out-line of his figure, and colour it with the exact uniform tinge it naturally diſplays: he ſurveys it in one certain point of view, and then proceeds to delineate and adapt his tints, as if the figure were, in reality, adhering to the canvaſs. It is no wonder, therefore, that the young Gentleman, juſt

mentioned, was aſtoniſhed to find, on examining the pictures, preſented to him, with his finger, that they had not the ſame projection, with the objects they repreſented. This, as well as the art of diminiſhing a figure, and ſtill preſerving the reſemblance, would evidently be as much an enigma, to a perſon juſt poſſeſſed of viſion, as the circumſtance of the Mirror, mentioned by *M Diderot.**

It is more than probable, therefore, that the blind man, has no ideas of colour, except, as has been already remarked, what are derived from a kind of diſtant analogy, regulated by the aſſociating powers of the mind, and preſerved by the memory; and, indeed, moſt of the perſons of this claſs I have converſed with, have frankly confeſſed themſelves wholly ignorant of its qualities. Nor is this deficiency in the forming of ideas peculiar to the ſenſe of ſight. A deaf man would be juſt as much embarraſſed, with reſpect to the qualities of ſound; and the ſame may be obſerved with reſpect to the other ſenſes.

In the courſe of my inquiries, however, on this ſubject, it occurred to me, that I might poſſibly derive ſome new matter for obſervation, from the recollection of the blind man's perceptions whilſt under the influence of his dreams. In the uſual ſilent hours of repoſe, when the

* Vid les Œuvres de M. Diderot, tom. II. Art. Lettres ſur les Aveugles, &c.

exerciſe

exerciſe of the memory is, in a great meaſure, ſuſpended; and the unfettered imagination diſplays its powers, in a very peculiar manner; I conceived it might be poſſible for the blind to experience ſome tranſient impreſſions, relative to viſual qualities. It is true Mr. Lock gives it as his opinion, "that the dreams of ſleeping "men are made up of waking men's ideas; "though," he allows, "they, are, for the moſt "part, oddly put together." The impreſſions of dreams, it muſt be acknowledged, are too fleeting to admit of much inveſtigation; and our recollection of them is liable to the greateſt uncertainty: yet, notwithſtanding the opinion of this great philoſopher, there are few, I am perſuaded, who have not felt themſelves ſometimes affected, during their dreams, in a manner which they could by no means account for, or reconcile with any circumſtance that had previouſly taken place in real life. And though I have not been able to gratify my curioſity to its full extent, yet I have gained ſufficient information to convince me, that the blind feel impreſſions in dreaming, in ſome degree, ſimilar to the viſible appearances of bodies. A blind Gentleman, with whom I have lately converſed, clearly proves to me, that he is conſcious of the figure, though he cannot diſtinguiſh the varieties of the human countenance: and from the confuſed efforts he makes to explain himſelf, it may be perceived, that he

feels himſelf alarmed with new ſenſations, that bear a ſtrong relation to our ideas of light and colour; but which he finds it impoſſible to deſcribe, becauſe he cannot fix on any comparative idea whereby to explain himſelf. Theſe dreams, my intelligent friend informs me, are always painful, and, as may naturally be expected, the impreſſions are extremely tranſient and unſatisfactory.

But it is not the blind only, who are unable to trace the various effects produced by light and colour. There are perſons, whoſe organs of viſion are ſo imperfectly formed, that they cannot diſtinguiſh colours, though they ſee the objects perfectly. In the Philoſophical Tranſactions we have an account of a man who knew no difference of colour whatever; and there is an ingenious perſon, within the circle of our acquaintance, whoſe knowledge in Perſpective, as well as in the other branches of Natural Philoſophy, is unqueſtionable; yet who finds himſelf deficient in diſcerning the difference of ſome colours, which he knows to exiſt, and which are diſtinguiſhable to perfect viſion. In particular, I think I have heard him mention, that the ſenſation he felt, from the colours of brown and green, had no obvious difference, provided they were diffuſed with equal degrees of intenſeneſs.

But theſe ſpeculations, however curious and entertaining, were not the principal objects I had

had in view, when I ſat down to conſider the ſubject of blindneſs. It may be remarked, that in the ſketches, relative to blind people, I have offered to your notice, I have purpoſely avoided ſpeaking of ſuch, as had ever poſſeſſed the faculty of viſion, ſo as to recollect it with any degree of accuracy: and I have been the more particular in my account of Dr. Moyes, and the blind projector of roads, becauſe I had an opportunity of availing myſelf of immediate information from them, with reſpect to ſuch peculiarities, as it was not in my power to derive from the writings of the few authors, who have treated on this ſubject.* In tracing the progreſs, and marking the degrees of perfection, to which the moſt celebrated blind people have carried the exertions of the other ſenſes, to ſupply the loſs of ſight; I was perſuaded, that farther obſervations and diſcoveries might be made, which might be applied to advantage in the education of blind children; and alſo in rendering more perfect, the different inventions, that have already been deviſed, in order to facilitate their information, and the means of their improvement: and I

* Beſides occaſional hints which I have acquired from converſing with various blind people, whoſe names are not mentioned; I have particular acknowledgments to make to Mr. Cheeſe, the organiſt of the collegiate church in Mancheſter, for the ſatisfaction he has afforded me in many of my inquiries.

flattered myſelf, that theſe matters would be deemed ſufficiently important, to engage the attention of the learned members of this Society. Inſtances too frequently occur, that moſt powerfully call for the generoſity and compaſſion of mankind; and though our abilities rarely arrive at the divine perfection of *giving ſight to the blind*, we ſhall always experience a conſcious benevolent ſatisfaction, in miniſtering to their knowledge, their convenience and happineſs.

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## A TREATISE ON SALTPETRE,

*By* JAMES MASSEY, Eſq.

---------- ſi quid noviſti rectius iſtis
Candidus Imperti, ſi non his utere mecum.

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### INTRODUCTORY OBSERVATIONS.

THE great importance of Saltpetre, ſince the invention of gun-powder, is too well known to be here expatiated upon, as well as the numerous rewards that have been offered to thoſe who ſhould give us the cleareſt and beſt accounts of it; a ſure ſign that, notwithſtanding it has been

been long made in very conſiderable quantities in almoſt every part of Europe, our knowledge of this ſalt is ſtill very imperfect.

This induced the author of the following pages, many years ago, to turn his attention to this ſubject, and he flatters himſelf, that, by long obſervation, and a practice which, though not very extenſive, may have been ſufficient for this purpoſe, he has made ſuch diſcoveries, as may render the buſineſs of ſaltpetre-making no leſs eaſy and familiar to his countrymen, than it has long been to our neighbours upon the continent.

He never, indeed, could be brought to believe, that it was owing to any defect in our climate, or to the want of materials, that we have ſo often failed in our attempts this way, but merely to our inattention to ſome particular points in the practical part, upon which our ſucceſs, in a great meaſure, depended. Theſe, therefore, he has principally laboured to explore, and to ſet them in ſo ſtrong a light, that they can no longer eſcape our obſervation.

It is the cuſtom of the ſaltpetre makers abroad, to wait till the earths they have procured, or prepared for this purpoſe, are found fit to anſwer their end; a practice, which we have reaſon to think has rarely been followed by our countrymen, who, finding the earths they have employed, imperfect upon the firſt trial, have ſeldom afforded them a ſecond, and thus have rejected many

many that, in a due courſe of time, might have anſwered their moſt ſanguine expectations.

They have, likewiſe, not duly attended to the large quantities of earth, that our neighbours are obliged to elixiviate, in order to obtain a ſmall portion of ſaltpetre; and finding their portion but trifling in the trials they have made, have too haſtily concluded this buſineſs to be ſcarcely worth following; when, had they reflected upon the great number of ſaltpetre-makers in France and Germany, they muſt, certainly, have entertained a very different opinion.

But what has chiefly diſcouraged us, we preſume, may have been, our ignorance of the true grounds and principles, upon which the practice of making ſaltpetre is founded; which, we may obſerve, have never been clearly laid open. All that we are told is, that ſaltpetre is extracted from the rubbiſh of old houſes, the bottoms of ſtinking pits and ditches, and the like; which has induced many perſons to conclude, that this ſalt is generated in theſe earths: whereas, the truth is, that nothing is extracted from theſe earths but a peculiar acid, which, in conjunction with the fixt ſalt of wood-aſhes, and not without, forms this neutral one which cryſtallizes in the ley when boiled down as above-mentioned; which circumſtances being omitted, it can be no wonder that we are led into very great errors.

Of

Of this acid, the ſource from which it is derived, and the manner in which theſe and other earths become impregnated with it, we ſhall endeavour to give the moſt full, and ſatisfactory account, as well as of the practical methods of making ſaltpetre, all which might be comprized in a page or two, had we not a variety of chimeras to encounter, and this practice particularly to explain. By theſe means we hope to remove all that myſtery and obſcurity in which this ſubject has been ſo long involved; and to render the practice of making ſaltpetre as eaſy and familiar to the Engliſh, as it has long been to the French and Germans, ſo much to the advantage of thoſe nations.

## ON SALTPETRE.

THE great uſe of ſaltpetre in the compoſition of gun-powder, has long rendered it an object of the firſt importance; upon which account, the learned have ſpared no pains to obtain the moſt perfect knowledge of it; but hitherto, as it ſeems, without ſucceſs, as no clear and ſatisfactory account has yet been given of it. And though the methods of making it in France, Germany, and many other parts of the world,

world, have been minutely deſcribed, theſe deſcriptions, through ſome defect or other, have been of little ſervice to us, if we may judge from the many fruitleſs attempts to make this ſalt in England.

The common accounts that are given us of nitre or ſaltpetre, are, indeed ſo very vague and various, as rather to confuſe and perplex, than give us any clear knowledge of it. Some will have it to be a production of *nature*, others entirely of *art*. Some tell us it is drawn from the air; others, that it is extracted from vegetables and animals. We are told too, that it is found upon the ſurface of the earth, and upon old walls in the form of hoar froſt, and that whole provinces are ſometimes covered over with it; all which is certainly very falſe and fallacious; if, by ſaltpetre, in this place, is meant that ſaline concrete, which is of ſo much uſe in the compoſition above-mentioned; which, though ſometimes found in the walks of nature, is moſt aſſuredly, in general, a production of art.

Saltpetre, to give a juſt deſcription of it, is a neutral ſaline concrete, evidently formed by a combination of a peculiar acid, with a fixt vegetable alkaline ſalt. This acid is found in certain earths, from which it is extracted, by elixiviating them along with wood-aſhes, the fixt ſalt of which, uniting with the acid, forms this neutral

neutral one, which cryſtallizes in the ley when boiled down to a due conſiſtence.

From this plain account of the formation of ſaltpetre, it muſt be obvious, that it can no where be found, without the concurrence of theſe two principles; and, conſequently, not in the air, or in vegetables or animals, becauſe, though this peculiar acid may, perhaps, be found in theſe ſubjects, the fixt ſalt muſt needs be wanting.

That it may be ſometimes found in the earth, we ſhall not deny, owing to the accidental introduction of wood-aſhes to a ſoil impregnated with this acid. And that from hence it may paſs into the ſtems and apices of ſome plants, with the moiſture that enters their roots, is far from being improbable. But that whole provinces can even be covered over with it, or that it can be generated in theſe organized bodies, as Lemeri and ſome others have imagined, muſt exceed all belief.

The accounts, which travellers generally give us of this ſalt, are, that it is extracted from the ſoil of the countries they have viſited, by elixiviating it with water, and evaporating the fluid; which we believe may be conſiſtent with truth; but here it ſhould not be forgotten, that a certain portion of wood-aſhes is always added to this ſoil before it is elixiviated, a circumſtance which, either through ignorance or inattention they have too often omitted to mention. We are told, indeed,

indeed, by Mr. Bowles, that in ſome parts of Spain, they have an earth that yields the cryſtals of this ſalt without any aſſiſtance of this kind; and this in ſuch quantities, as might ſupply all Europe with this article. But till this fact is better authenticated, we have many reaſons to doubt the truth of it.

Be this as it may, we ſhall here judge it of more uſe, to advert to thoſe earths, that are well known, with the aſſiſtance of wood aſhes, to yield us the cryſtals of this ſalt, to point out their peculiar quality, and the ſource from which it is derived; together with the true reaſon why they are not always in a condition to yield us theſe cryſtals, even with the addition of a fixt ſalt; a circumſtance that has much perplexed the moſt experienced ſaltpetre-makers. After which, nothing we truſt will remain, but to lay down the practical methods of making it, ſupported by the beſt authorities, as well as our own experience.

Of theſe earths, the moſt diſtinguiſhed are, the rubbiſh of old houſes, the ruins of old vaults and cellars, &c. which rarely fail to yield us the cryſtals of this ſalt, when elixiviated with wood aſhes. That theſe earths poſſeſs an acid quality, is not to be diſputed; ſeeing, that upon reducing them to a coarſe powder, and percolating a fixt alkaline ſolution through them, this ſolution will be neutralized, and no longer yield us an alkaline, but a neutral ſalt.

From

From what ſource this acid is derived, is at preſent unknown. The moſt general opinion is, that it is drawn from the air; but to this there are many objections. In the firſt place, the aerial or univerſal acid, is generally allowed to be not of the *nitrous*, but *vitriolic* kind. And ſecondly, there are many earths impregnated with this acid, which, in all appearance, have had no communication with the air, of which the ſoil at the bottoms of graves is a flagrant inſtance.

From the well known fact, that the rubbiſh of all ſuch houſes, as have been occupied by the filthieſt inhabitants, and of ſuch clay walls, as have ſtood in the neighbourhood of dunghills, or wherever putrid vapours more plentifully abound, is always moſt ſtrongly impregnated with this acid, it is moſt natural to believe, that theſe vapours muſt confer it upon them, and conſequently, that it muſt have its origin in putrid ſubſtances; but to this, there are likewiſe many objections. In the firſt place, the recent juices of vegetables and animals, ſome few of the former excepted, if we are not miſtaken, contain no kind of acid whatever; and in a putrid ſtate, every body knows they are of a volatile *alkaline* nature, which being the moſt powerful objection, we ſhall here principally endeavour to remove; and upon the whole, ſhall undertake to ſhew, that there is an original

acid

acid in all vegetables and animals, which being rendered volatile by putrefaction, aſſumes the ſpecific character of the nitrous. And that, ſince this acid conſtantly ariſes in vapour from putrid ſubſtances, hence it is, that the rubbiſh of old houſes, and of old clay walls, become impregnated with it, as well as thoſe earths that lie in conjunction with them.

That the recent juices of vegetables and animals, are, in general, perfectly neutral, we ſhall readily admit; but from hence, we think it does not follow, that they contain neither an *acid* nor *alkali*, as is commonly concluded; on the contrary, we apprehend, a more juſt inference is, that being *mixt*, they muſt neceſſarily contain *both*. It is certain, that if we throw a calcareous earth, or fixt ſalt into any of theſe juices, the earth or ſalt will be neutralized by it; which we take to be a proof, that it contains an acid, which quits the *weaker* to join with the *ſtronger* alkali, according to the law of affinities.

And the caſe will be the ſame, if theſe juices are putrefied. If we throw a fixt ſalt into any putrid liquor, it will be neutralized by it, and now, if we dip a piece of ſoft paper into this mixture and dry it, it will burn like a match, in the ſame manner as if dipped into a weak ſolution of ſaltpetre; which ſhows, that it not only contains an acid, but one of the *nitrous* ſort; and provided this liquor were perfectly putrefied,

fied, and the marine ſalt, with which all nitrous leys greatly abound, carefully removed, we cannot help thinking that upon being boiled down to a due conſiſtence it would yield the cryſtals of ſaltpetre. The author muſt acknowledge he has boiled down many of theſe mixtures without ſucceſs; but it was at a time when he was ignorant of the neceſſity of attending to the above circumſtances.

That all putrid ſubſtances, and conſequently, their juices, are of a volatile alkaline nature, is not to be denied, owing to an union of their acid and oily parts with their earth, which is equally ſubtilized by the putrid proceſs. But that the two former are ſafely ſeparated from the latter, by adding a calcareous earth or fixt ſalt to them, the meaneſt chemiſt can tell us, the earthy or alkaline part flying off, and leaving the acid and oily ones combined with the earth or ſalt, with which they have a greater affinity. And that thus calcareous earths, by lying in conjunction with putrid matters, become poſſeſſed of a *volatile acid, oily mixt*, which is *Stahl*'s preciſe deſcription of the nitrous acid, muſt be clear to conviction.

But the ſtrongeſt proof of the exiſtence of an acid in putrid juices, if the earths of ſtables and cow-ſtalls do not afford an equal one, muſt be drawn from the ſoil at the bottoms of graves, which can certainly derive its nitrous acid quality

from nothing, but the corrupt bodies with which it lies in contact; and this may ſatisfy us, in reſpect to the ſource, from which other abſorbent earths may derive it.

Other earths, in common uſe among the ſaltpetre-makers, are thoſe of ſtables and cow-ſtalls, that have drank up much animal urine; the bottoms of ſtinking pits and ditches, and the like. Theſe they take out, and lay in heaps, till, by repeated trials, they find them fit for their purpoſe. It is commonly ſuppoſed, that, during this period, they draw their nitrous quality from the air; but for this, there is certainly no juſt foundation, ſeeing they are brought to maturity as ſoon, in the cloſeſt vault or cellar, as in the moſt open expoſure. The truth is, that all putrid juices contain many oily and mucilaginous parts, which, till they are duly attenuated by putrefaction, will not ſuffer any cryſtals to form in the leys that are drawn from theſe earths; and they are laid in theſe heaps, for this event to take place. Another end is anſwered by this manœuvre. By being thus laid apart, theſe earths are prevented from receiving any freſh ſupplies of *unputrid* matter, which might contaminate the juices, that were already far advanced in putrefaction.

The ingenious author of the Chemical Dictionary has told us, That the nitrous acid is no

where

where found, but in ſuch earths, as are impregnated with the juices of vegetables and animals, and where theſe juices *have ſuſtained the whole putrefactive proceſs*. But having aſſigned no reaſon for it, he ſeems to have been little regarded. The obſervation is, however, certainly a very juſt one, and had it been duly attended to, we imagine, might have prevented moſt of thoſe diſappointments, which our countrymen have met with, in their attempts to make ſaltpetre; as we have reaſon to think, they have been chiefly owing to their premature uſe of theſe earths.

The common ſoil, in ſome parts of India, is naturally nitrous, owing plainly to the fiſh and ſlime that is left upon it by the inundations of the river Ganges, which ſoon corrupt in that hot climate, and fill the earth with putrid juices; and here putrefaction, being carried on with the greateſt rapidity, is, of courſe, ſoon completed, and the natives are, in a ſhort time, furniſhed with a nitrous earth perfectly matured. But it muſt not be forgotten, that their ſtrongeſt earths are found at the bottoms of their tanks or ſhallow ponds of water, which, in this country, are often of great extent, where, the water being evaporated by the heat of the ſun, large quantities of fiſh are left to corrupt, which furniſh a mud of the ſtrongeſt nitrous quality.

In this manner, are nitrous earths naturally formed in theſe parts of the world, and might, doubtleſs, be formed in others, though not perhaps ſo expeditiouſly, by throwing into ſhallow ponds of water, natural or artificial, all ſorts of dung and carrion, with other putrid and putrefiable matters; where the water, being evaporated by the heat of our ſummers, muſt certainly leave a mud of the ſame kind and quality.

Putrid juices and putrid vapours are diſperſed through the earth and air, ſo that there are few earths, of an abſorbent kind, that are not, in ſome degree, nitrous. But it is in thoſe only that have been drenched in an extraordinary degree with theſe juices, or have been long expoſed to theſe vapours, that this acid is found of any conſiderable ſtrength. And, even here, we find it but very ſparingly diffeminated in them, if we may judge from the large quantities of earth that muſt be elixiviated, to obtain a ſmall portion of ſaltpetre. *Cramer* has told us, that two ounces of ſaltpetre may ſometimes be extracted from one pound of earth, which we have reaſon to think is an arrant fable; ſince, in the city of Paris, where, we may preſume, thoſe earths are ſelected with the beſt judgment, we ſhall find that one buſhel of earth, with half that quantity of wood-aſhes, will ſcarce produce one pound of this ſalt; and we are informed, that it requires eight cart loads,

loads, which are perhaps ſmall ones, to make one hundred weight. There can be no doubt, that the trifling value of the materials, and the ſmall labour that is required, alone enable the ſaltpetre makers to carry on this buſineſs, and that, under the ſame circumſtances it may be carried on in other places.

From the nature and conſtitution of theſe earths, it muſt be evident, that they may be eaſily formed by methods of art, nothing more being neceſſary than to lay calcareous earths, in conjunction with putrid matters, or to drench them with their juices, and to wait, till we find them fit for our purpoſe. All this is well known; but not ſo, we apprehend, the proceſs by which they are brought to maturity, which is the reaſon that our patience is often put to too ſevere a trial, in waiting for this event. It is a folly to deny, that it is yet a ſecret, that theſe earths derive their peculiar quality from the putrid matters with which they are connected, and that they are brought to maturity, entirely by putrefaction.

Glauber, who, from the obſervations he had made upon the fruits and effects of the bottoms of ſtinking ditches, ſeems to be the firſt that attempted to form artificial nitre beds, threw into pits, covered from the rain and ſun, but expoſed as much as poſſible to the air, all ſorts of dung, with the cuttings of trees, refuſe of

gardens, and other putrid and putrefiable matters, to which he added wood-aſhes; and by this means, in a courſe of time, obtained, not a mere *nitrous*, but a *true ſaltpetre* earth, that afforded him the cryſtals of this ſalt, upon ſimple elixiviation and evaporation.

It does not appear, that this celebrated Chemiſt had the leaſt idea, that theſe putrid matters were of any other uſe, than to draw the nitre, as he called it, from the air, in which the fixt ſalt of the wood-aſhes might poſſibly aſſiſt. In this ſtate of ignorance, his followers, for the moſt part, ſeem ſtill to remain; having adopted, as far as we know, no other doctrine; and having varied from this practice, only in diſpoſing theſe materials above ground, inſtead of below, in order to expoſe them the more to this element.

It muſt not be paſſed over, that Glauber ſometimes filled large wooden veſſels with all kinds of dung, and, when they had completed their putrefaction, he percolated a ſtrong alkaline ſolution, through them, drawn from lime and wood-aſhes, which afforded him a ley of the ſame kind and quality, with that drawn from the earth of his other nitre beds.

A late writer has told us, that there are but three ways of obtaining nitrous earths. In *walls*, that is, by raiſing clay walls, and expoſing them to the air—In *pits*; by throwing all ſorts of putrid

putrid and putrefiable ſubſtances into them—And in hovels; by laying theſe materials in heaps under them. The firſt he diſapproves, becauſe, as he tells us, though theſe walls are generally covered with ſtraw, the nitre, or rather the nitrous earth that is formed upon them, is frequently waſhed away by the rain. But there is certainly another objection, and that is, the tedious time which theſe walls muſt commonly ſtand, except they are raiſed in the neighbourhood of dunghills, before they receive any conſiderable impregnation. In Pruſſia, where we are told theſe walls are raiſed, by order of the king, throughout the country, for the uſe of the ſaltpetre makers, we are at the ſame time informed, they are often found but weakly impregnated, at the end of twenty years, though dung or litter is ſometimes mixt up with the clay, of which they are compoſed.

He does not approve of diſpoſing the materials in pits, becauſe, as he obſerves, the air cannot be conveniently admitted to their interior parts. He, therefore, gives the preference to the diſpoſal of them under hoyels, where, by various contrivances that he lays down, the air may be freely admitted to them. And here we ſhould certainly join him, could we be brought to believe that a current of air, for which he contends, was any great promoter of putrefaction. But we have been told, and have

good cauſe to believe, that a cloſe, warm, moiſt air is the greateſt promoter of this proceſs; and, therefore, muſt have leave to think, that a vault, or a cellar, muſt be the moſt proper repoſitory for theſe materials, where their putrefaction, being carried on with the greateſt vigour, muſt, of courſe, be the ſooner completed.

Or, in defect of theſe conveniences, that the ſame end might be anſwered by laying them, about a yard thick, upon a piece of ground, ſunk a few inches below the level, and bedded with clay, where, through the rain that falls, in the ſpace of a year or two, they muſt be completely putrefied; particularly, if they were now and then turned over, and no freſh additions were made to them; for, whilſt we continue to heap freſh materials upon old dunghills, it is impoſſible that the whole maſs ſhould be equally putrefied.

It is obſervable, that the writer laſt mentioned ſays not a word of the uſe of putrefaction, nor of the expediency of promoting this proceſs, by all the means that lie in our power, in order to accelerate the maturity of theſe earths; which we commonly attribute to his ignorance of this circumſtance.

Nor does the practice of the ſaltpetre makers indicate any ſuperior knowledge. Many of their nitre beds are raiſed ten or twelve feet high, whoſe putrefaction muſt advance very ſlowly, through the preſſure of the *upper* parts upon the

*lower*

*lower*, and the want of moiſture, which cannot eaſily be introduced to ſuch lofty heaps.

About thirty years ago, an ingenious Chemiſt, of our own nation, having viſited many of the great works abroad, and made the obſervation, that to form a nitrous earth, nothing more appeared to be neceſſary, than to mix up calcareous earths with any kind of dung, and expoſe theſe materials to the air, returned home, fully perſuaded that he was maſter of the ſecret, and had intereſt enough to prevail upon many of his friends to join him, in erecting a large ſaltpetre work, at Fulham, near London. Here, many hundred loads of lime were got together, and laid with ſtrata of horſe muck, in long high ridges, the more to be expoſed to this element; the conſequence of which was, that the rain running off, without penetrating the maſs, no putrefaction enſued, and the lime, at the end of four or five years, was found to have received little or no impregnation; upon which the work was dropped, with great loſs to the Proprietors.

Two errors were here committed. In the firſt place, the dung, which ought to have been, at leaſt, in treble the proportion to the lime, made but about one fourth part of the heaps. And ſecondly, they were ſo diſpoſed, that, for want of moiſture, they could never enter into a putrid ſtate: whereas, had the dung been in a due proportion, and the whole been ſpread about a yard thick,

thick, there can be no diſpute, that, in the ſpace of a year or two, they had been perfectly putrefied, and a nitrous earth had been formed that might have prevented this cataſtrophe; eſpecially if the heap had been treated, as we have before hinted.

When the author ſaw theſe materials, ſome time after the work was dropped, the dung appeared to have been quite burnt up by the lime, and to have had no effect upon it; but his judgment was not then ripe enough, to point out the cauſe of this diſaſter.

This work, as we have been informed, was afterwards taken up by a foreigner, who formed his nitre beds in a very different manner; but they were raiſed ſo high, and conſequently ſo long in arriving at maturity, as quite tired out the patience of thoſe who were concerned with him.

There may have been other reaſons for laying aſide this work; and among the reſt, its not anſwering the expectations of the Proprietors in reſpect to profit; which, in new undertakings, are apt to run pretty high, without conſidering, that the profits of every buſineſs depend upon the ſkill and knowledge with which it is conducted. We have before remarked, that Glauber generally added wood-aſhes to the materials, of which he compoſed his nitre beds; by which means, in a courſe of time, he obtained not a mere

mere *nitrous*, but a true *ſaltpetre* earth, which required nothing but elixiviation with water, and a ſubſequent evaporation, to afford him the cryſtals of this ſalt; which practice is ſtill followed by many of his ſucceſſors; though, as it ſeems, without any clear conviction of their uſe; it being a point in diſpute, whether they are of any uſe or not.

The author of the article *Nitre*, in the French Encyclopædia, boldly affirms, that the juices or decoctions of all ſuch plants, as yield much fixt ſalt by incineration, being putrefied and clarified with lime, according to Mr. Boldue's method, laid down in the Memoirs of the Academy of Sciences for the year 1734, will yield us the cryſtals of a true ſaltpetre, without the aſſiſtance of any fixt alkaline ſalt whatever; and that at Montpelier, and all over Languedoc, they make ſaltpetre without uſing the leaſt particle of ſuch ſalt. Upon which we can only obſerve, that if this be a fact, it muſt be very ſurprizing, that it is not known in Paris, and that the Gentlemen of the Academy, who, ſome time ago, drew up and publiſhed by order of their monarch, an account of the ſeveral methods of making ſaltpetre in all parts of the world, ſo far as they could arrive at the knowledge of them, ſhould not take the leaſt notice of it; though they have thought proper to record one of a ſimilar nature, Mr. Brown's method of making ſaltpetre in Virginia.

This

This Gentleman tells us, that if we ſprinkle the clay floor of a tobacco houſe with *ambeer*, which we take to be a putrid infuſion of tobacco, and cover it with the rotten leaves, in a fortnight's time, upon removing the leaves, we ſhall find the floor covered with ſaltpetre, in the form of hoar froſt, *drawn from the air*, which being ſwept up, and elixiviated with warm water, will afford us a ley, that, being boiled down to the conſiſtence of cream, will ſhoot into cryſtals of this ſalt. Now we can eaſily believe, that theſe ſweepings, with the aſſiſtance of wood-aſhes, would afford us ſuch a ley, but not without; and therefore muſt conclude, that there is here ſome omiſſion.

We muſt farther obſerve, that this Gentleman takes no notice of any marine ſalt that is formed in this ley, which, being found in all nitrous leys, muſt render this account very ſuſpicious. And what may give us a more unfavourable opinion of this method, is, that, ſince the author obtained a reward of three hundred pounds from the Britiſh Parliament for this notable diſcovery, we have heard no more of it.

Whilſt the ſeveral parts or principles of which this ſaline concrete is compoſed remained unknown, we might give credit to a number of tales reſpecting its origin and formation; which, at this time, without betraying the greateſt weakneſs,

neſs, we cannot give the leaſt ear to—of its being drawn from the air—of its being generated in vegetables and animals—of its being found upon the ſurface of old walls—and, to conclude the whole, of its being formed without the aſſiſtance of a fixt ſalt; all which muſt be found equally repugnant to reaſon and experience, which we may bring the ordinary practice of making ſaltpetre to confirm.

And here, we cannot help expreſſing our ſurprize, that ſo much time has been ſpent by many ingenious perſons in the diſcovery of *new* methods of making ſaltpetre, when it muſt be obvious, that, in caſe they ſucceeded, there is none that could be more plain, ſimple, and leſs expenſive, than the *old* and approved one, of which we ſhall now proceed to give a more particular account.

In large and populous towns, the ſaltpetre makers chiefly make uſe of the rubbiſh of old houſes, the ruins of old vaults and cellars, &c. Theſe they collect, and, having reduced them to a coarſe powder, elixiviate with about one third the quantity of wood-aſhes; in which ley, when boiled down to a due conſiſtence, the cryſtals of ſaltpetre are found to ſhoot. During the boiling, large quantities of marine ſalt are formed in this lixivium, which, cryſtallizing whilſt the liquor is hot, are taken out with perforated ladles.

The

The ley is then taken out, and ſet in a cool place for the ſaltpetre to cryſtallize.

In defect of theſe earths, they collect thoſe of ſtables and cow-ſtalls, that have drank up much animal urine, the bottoms of ſtinking pits and ditches, eſpecially of thoſe, that have received the contents of ſlaughter and privy houſes. Theſe they take out, and lay in heaps, commonly mixt up with a little lime, till, by repeated trials, they find them fit for their purpoſe; which is known, in ſome meaſure, by their having totally loſt their offenſive odour, a ſure ſign that their putrefaction is completed.

Where theſe earths cannot be procured in ſufficient quantities, they form, what are called, artificial nitre beds, by laying all ſorts of putrid and putrefiable ſubſtances in conjunction with calcareous earths, keeping them in a moiſt ſtate, and waiting, as the phraſe is, till they are brought to maturity. If the wood-aſhes are not added, when theſe materials are committed to putrefaction, they are added when they are elixiviated, but never, that we have heard, omitted.

The common peaſants in France and Germany, who are almoſt all ſaltpetre makers, ſcrape together the muck and offals of their farm yards, and, throwing them under open ſheds, ſuffer them to lie, till they find they will anſwer their end. Though they know little of the uſe of putrefaction, they take care to promote this proceſs, by

by drenching them with urine or muck water, and frequently turning them over, by which means, they are brought to maturity much ſooner than the larger nitre beds. Theſe materials, with the wood-aſhes that their hearths ſupply, if not added before, are thrown into a large tub, and water poured upon them, which runs out through a hole, ſtuffed with ſtraw, at the bottom of the veſſel. Thus ſimply do they procure their leys, in the boiling of which, their women and children are chiefly employed.

Where any article of commerce is compoſed of materials of little or no value, and which require ſmall ſkill or ingenuity to manufacture, great numbers of poor perſons will naturally take up this employment, whoſe diſtreſſes will oblige them to diſpoſe of it, upon the moſt moderate terms; to which they will be farther urged by the policy of the government under which they live, which will reſtrain them from exporting it, till its own wants is ſupplied. To this we may fairly attribute the ſmall price that ſaltpetre bears in France and Germany. But this can be no diſcouragement to the Engliſh, among whom it bears a much greater price, notwithſtanding the importations of their India Company; and conſequently, muſt afford the makers a much greater profit, ſhould the government refuſe, by a ſmall bounty of one penny

per

per pound, upon all the ſaltpetre made in England, to give them ſuitable encouragement.

The French are not inſenſible of the great advantages they derive, from making their own ſaltpetre; and, therefore, pay no ſmall attention to it.

The ſaltpetre makers in Paris are incorporated, and have, beſides, the privilege of carrying off the rubbiſh of all the old houſes they ſhall think proper, without fee or reward; though this indeed is but a poor compenſation for the extraordinary expence they are put to in firing, in a city where fuel is ſo dear.

In the year 1775, ſome defect being found in the ſaltpetre brought to market, owing more, perhaps, to their parſimonious methods of making it, than to any thing elſe, the King of France immediately ordered a committee, of the Gentlemen of the Academy, to draw up and publiſh an account of the ſeveral methods of making ſaltpetre, in all parts of the world, that all his ſubjects might be made equally acquainted with them; and, at the ſame time, offered a conſiderable reward, to whoever ſhould diſcover the ſecret of nature in the formation of this ſalt, that they might equally avail themſelves of it.

It has been ſhewn, that nitrous earths are not uncommon in the walks of nature, and that, by the addition of wood-aſhes to them, they are converted into true ſaltpetre earths. Now it is only

only allowing that theſe aſhes may ſometimes be accidentally introduced to an earth of this kind, to ſhew us how a true ſaltpetre earth may naturally be formed; and if the ſtreets of the city of Paris, or their dunghills upon which they throw their wood-aſhes, ſometimes exhibit a true ſaltpetre earth, it can be no great rarity.

It can ſcarcely be conceived that the Engliſh have been ignorant of the method of making ſaltpetre in France and Germany, where this buſineſs has been long carried on, in the moſt public and open manner. But that ſome points of no ſmall importance may have eſcaped their obſervation, may eaſily be credited, from the ill ſucceſs with which their attempts have always been attended; and none more likely than their cuſtom of waiting till the materials, they lay together, for this purpoſe, are found fit to anſwer their end.

The author of this Eſſay once formed a nitre bed with great care and exactneſs; and, at the end of a year, expected to have reaped the fruits of his labour; but herein was totally diſappointed. The leys, that he drew from theſe earths, afforded him no cryſtals of this ſalt; upon which they were thrown aſide as uſeleſs; till, a year or two after, he took it into his head to make a ſecond trial of them, and now found they anſwered his purpoſe extremely well; which he could only attribute to their being more per-

fectly putrefied, as they had been ſecluded from the air the whole time. This gave him the firſt idea of the uſe and neceſſity of putrefaction, which made too ſtrong an impreſſion upon his mind to be eaſily eraſed.

With earths, thus duly matured, we can ſcarcely fail of ſucceeding in this buſineſs as well as our neighbours. Yet there may be reaſons for our declining it.

The large quantities of earth that muſt be elixiviated to obtain a ſmall portion of ſaltpetre, it muſt be owned, affords no very tempting proſpect. And the fears of not finding a ſufficient quantity of wood-aſhes in this country may have ſtill greater weight.

The labour of collecting theſe earths, it is certain, cannot be ſmall; yet may the value of this commodity fully pay the price of it, when brought to a good market, which it is likely to find in England.

In reſpect to wood-aſhes, they may reaſonably be judged to be leſs plentiful in this than in other countries where wood is the only fuel. But where pot-aſh is made, in conſiderable quantities, as in many of our counties, there certainly can be no ſcarcity of them; and, if their place may be ſupplied by another commodity equally cheap, and eaſily procured, we can never find any real want of them. This is foreign pot-aſh, which we find recommended in a ſmall work, not long ago publiſhed,

publiſhed, by order of the King of France, by ſome of the moſt eminent chemiſts, as far preferable to wood-aſhes. Upon many accounts it has been before obſerved, that Glauber, ſometimes, threw all ſorts of dung into a large wooden veſſel, and, when they had completed their putrefaction, percolated a fixt alkaline ſolution through them; which furniſhed him with a ley of the ſame kind and nature with that drawn from nitrous earths and wood-aſhes. This, we may preſume, gave occaſion for theſe ingenious Gentlemen to make ſome experiments this way, the reſult of which they have given to the public. We tried this method many years ago, with ſome ſucceſs; but found it depended upon the maturity of the materials; which, indeed, may be collected from Glauber. What the French writers have ſaid upon this ſubject, we ſhall give in a poſtſcript; in order to remove every objection againſt our attempting to make ſaltpetre in England, upon account of the ſcarcity of wood aſhes.

This difficulty being got over, we truſt nothing will remain, but to give ſuch an account of the practical method of making ſaltpetre as may be relied on, and be ſufficiently explicit, to prevent our falling into any errors.

The ſaltpetre makers in Paris chiefly make uſe of the rubbiſh of old houſes, the ruins of old vaults, and cellars, &c. This they reduce to a

coarſe powder, and having ſcreened it, proceed as follows.

They provide a number of ſmall open tubs, which they prefer to large ones, upon account of their being more eaſily moved, and emptied of the materials. Theſe they place upon ſtillages, about two feet high, and in ſuch a manner that one veſſel may receive the ley, that runs from two of them. In each tub, near the bottom, is fixt a ſpiggot and fauſet, and, to prevent the wood-aſhes from choaking up the latter, a parcel of the round earth is thrown in firſt, and the aſhes upon it. They then add the remainder of the earth in the proportion of two buſhels of the latter to one of the former. They throw the earth in lightly, that the water may more readily paſs throught it, and they hollow it at the top, that it may more conveniently receive it.

They have different numbers of theſe tubs, but generally twenty four, which they place in three rows, eight in each; and into each tub they throw three buſhels of wood-aſhes, and ſix of earth. Ten demiqueus * of water being paſſed through the firſt row of eight tubs, is poured upon the ſecond, and afterwards upon the third; and now the firſt row of eight tubs being emptied of the earth and aſhes, is re-

* A demiqueu, as far as we can learn, contains about ninety gallons.

pleniſhed

pleniſhed with freſh materials, and the ley, which has paſſed through the three rows of eight tubs, is paſſed through this likewiſe.

Having thus paſſed through four rows of eight tubs, and been reduced to two demiqueus by the abſorption of the materials, it is carried to the boiler under the name of *le Cuite*.

Such is the proceſs when a new work is erected; in an old one, only ſix demiqueus of water are paſſed through the three rows of eight tubs, which are filled with freſh materials every day,

The lixivium is carefully ſcummed, during the boiling, and, when it is ſo far advanced, that a pellicle begins to appear upon the ſurface, a workman is conſtantly employed, with a perforated ladle, to take out the marine ſalt, which now begins to form and fall to the bottom of the boiler. This being thrown into a whiſket, drains into the boiler again. When the lixivium is ſo far evaporated, that a drop of it will congeal upon a piece of cold iron, it is taken out, and thrown into a tub, for the remainder of the marine ſalt, and other dregs, to ſettle; and, after ſtanding about half an hour, it is drawn off, whilſt yet warm, into ſhallow copper pans, and ſet in a cool place for the ſaltpetre to cryſtallize.

The produce of this operation is generally about one hundred and thirty pounds of a brown

ſort of ſaltpetre, which is ſold to government for three-pence halfpenny per pound, and carried to the arſenal to be refined.

The liquor remaining in the baſons, when the ſaltpetre is cryſtallized, is called *Eau Mere*, or mother water, and is poured upon the earths in ſmall quantities, when diſpoſed in the tubs for elixiviation; though ſome makers think it beſt to dilute it with water, and percolate it through a freſh bed of wood-aſhes. The earths, when diſcharged from the tubs, are thrown aſide to dry under an hovel, and when dry, are ſpread, about a foot thick, to receive the ſcummings, *eau mere*, putrid urine, or any other putrid liquor, they can get to throw upon them, and in a few months, we are told, are fit for uſe, a ſecond time, particularly, if now and then turned over.

To improve the colour of this ſaltpetre, and to cleanſe it ſtill more from the marine ſalt, two thouſand weight is thrown into a large boiler, with one demiqueu of water, in which it diſſolves, and, in the courſe of the boiling, another demiqueu is added by pailfuls, which, every time it is thrown in, raiſes a thick ſcum that is carefully removed. And now, the evaporation being pretty far advanced, and the marine ſalt taken out as before, a large pitcher of whites of eggs, or of a ſolution of iſinglaſs or Engliſh glue, is poured in, and well ſtirred-up in it, which raiſes a thick

a thick black ſcum, and is taken off with it. But, before the whites of eggs, &c. are thrown in, the boiling liquor is cooled, by adding a pailful of cold water. The lixivium being thus clarified, is treated as before.

The *eau mere* of this operation, being boiled again, yields a ſaltpetre of the ſame colour with the firſt; and ſome ſaltpetre goes through a third operation of the ſame kind to give it a greater degree of purity.

The baſons in which the ley is ſet for the ſaltpetre to cryſtallize, are cloſely fitted with wooden covers, to prevent the too free entrance of the air, which, by cooling the liquor too ſoon, would not admit the cryſtals to form of ſo large a ſize.

The cryſtallization is generally completed in two or three days; and about one fourth part is ſuppoſed to be loſt in refining.

Such is the method of making ſaltpetre in Paris, as tranſmitted to us by thoſe whoſe knowledge and veracity cannot be called in queſtion; in which we can find no myſtery or difficulty, or any expence that can reaſonably deter us from engaging in undertakings of this kind. The Engliſh, will, in all probability, be obliged to employ other earths than the rubbiſh of old houſes, which is the caſe with all our neighbours, that do not live in large and populous towns; of which earths, we flatter ourſelves, we have given a full deſcription. And here we cannot help

obſerving one encouragement which an adventurer in this way will always have, viz. that whatever materials he may lay together, for this purpoſe, if they do not anſwer his end, as a ſaltpetre maker, will always find their value with the farmer.

Wood-aſhes are certainly an article of great importance, but ſhould they ever be found wanting their deficiency may be ſupplied, as we have hinted above. Thoſe who may engage in theſe undertakings, with the leaſt riſque or expence, are certainly the pot-aſh makers in this kingdom, who, being provided with the neceſſary utenſils, can only want a proper earth to begin their operations, which, in caſe they are unprovided, we have ſhown, may be eaſily procured in the ſpace of a year or two, by mixing up their dunghills with fallen lime, and ſuffering them to lie till they are perfectly putrefied.

The author, ſome years ago, cauſed a trench to be dug in an open field, ten yards long, one yard wide, and one foot deep. This he half filled with good muck from a dunghill, and covering it up with the ſoil, mixt with one third the quantity of fallen lime, left it to take its fate. The weeds were plucked off, as they ſprouted up, and it was twice turned over in the ſpace of a year; at the end of which, this earth, being elixiviated with wood-aſhes, afforded him fair cryſtals of

of ſaltpetre. In ſo eaſy a manner may a nitrous earth be prepared.

We ſhall add no more than that the crofter's ley, after it has performed its office of carrying off the foul oily parts of linen, or linen yarn, and which is generally ſuffered to run waſte, may here be certainly uſed to good advantage: and that we would adviſe every one who is inclined to try experiments, in this way, not to make them with leſs than one buſhel of earth, and half this quantity of wood-aſhes, from which two gallons of ley may be drawn, which, being boiled down to about a pint, may indicate the ſucceſs, if any is to be expected.

P. S. *Of the Uſe of Pot-aſh in making of Salt-petre, tranſlated from the French.*

Thoſe who have attended to the former part of this work, will, doubtleſs, be ſenſible of the uſe of wood-aſhes in the formation of ſaltpetre. That it is impoſſible to make this ſalt without them, or ſomething of a ſimilar nature. Remembering that ſaltpetre, properly ſpeaking, is a compoſition of two ſubſtances, united and combined in the ſame proportion, which are the nitrous acid, and a fixt alkali.

That the ſaltpetre formed in ſome earths, for the moſt part contains only one of theſe two principles; the nitrous acid, which being combined with a calcareous earth, forms a nitre

with

with an earthy baſis, from which the earth muſt be precipitated, and a fixt ſalt introduced in its ſtead, to convert it into a true ſaltpetre.

Wood-aſhes, upon account of the fixt alkali they contain, are very proper for this purpoſe, and the ſaltpetre makers, by mixing theſe aſhes with the earths they elixiviate, perform a complex operation in chemiſtry; they decompoſe one ſalt, and compoſe another.

But as it is the fixt alkali, in the wood-aſhes, that alone acts upon the nitre with an earthy baſis, it follows, that if we extract this alkali from them, by elixiviation and evaporation, it will be brought into a ſmaller compaſs, and ſupply the place of a large quantity of wood-aſhes.

The fixt alkali, or ſalt extracted from wood-aſhes, is known, in commerce, by the name of *Pot-aſh*, and is made in large quantities in Sweden, Denmark, and in all the northern parts of Germany; nor is it hard to procure pot-aſh of a good quality in France, ſo that we have always a ſimple, eaſy, and cheap method of ſupplying the place of wood-aſhes in thoſe provinces where they are ſcarce or dear, and the buſineſs of ſaltpetre-making contracted upon this account.

And we can aſſure the reader, that where wood-aſhes are found in the greateſt plenty, pot-aſh will be found far preferable to them for the following reaſons.

In

In the firſt place, becauſe the wood-aſhes uſed by the ſaltpetre makers, in large towns, are generally the refuſe of other trades, and contain little or no fixt alkali. Thoſe that are uſed by the ſaltpetre makers in Paris are of this ſort, and often afford, upon elixiviation, only a little Glauber's ſalt, Tartar of vitriol, and above all, large quantities of marine ſalt, of which the tartar of vitriol alone contains any fixt vegetable alkali, that can furniſh the baſis of ſaltpetre, or be of any uſe in decompoſing the nitre with an earthy baſis.

Secondly, wood-aſhes taking up one third of the room in the veſſels, in which the lixivium is made, there is, of courſe, leſs room for the earth, and the ſaltpetre muſt conſequently be leſs in proportion.

Thirdly, wood-aſhes, being very porous, abſorb a large quantity of water, which they obſtinately retain, and this water holds a quantity of ſaltpetre in ſolution, which is a clear loſs in proportion to the quantity of water they contain.

Fourthly, wood-aſhes bear a very conſiderable price in moſt parts of France, and we are certain this price is ſuperior to that of pot-aſh, conſidering the portion of fixt alkali that they reſpectively contain.

Fifthly, theſe aſhes are commonly impregnated with many groſs parts, and much dirt and filth, that

that is extracted from them, which muſt not only injure the ſaltpetre, but obſtruct its cryſtallization.

All theſe things being conſidered, with the practice of the Swedes, and the ſucceſs of our own experiments, we judge ourſelves authorized to adviſe all thoſe who are employed in making ſaltpetre, to place but a few wood-aſhes at the bottom of their tubs, to ſerve by way of filter, and to ſupply their place with pot-aſh in the following manner.

When the tubs are filled with earth, the quantity of pot-aſh we mean to employ, is to be laid upon it, and we are to proceed to elixiviate it in the uſual way. The water will immediately diſſolve the pot-aſh, which filtering through the earth, will decompoſe the nitre with an earthy baſis, and convert it into ſaltpetre, and, if the pot-aſh has been in a juſt proportion, none of the former will be left behind. It is not neceſſary to lay the pot-aſh upon the earth, in all the tubs, but only upon thoſe in the firſt row; becauſe theſe earths being waſhed ſucceſſively by three waters, the leſs pot-aſh will remain in them.

Nothing can be ſaid, preciſely, of the quantity of pot-aſh to be laid upon any given quantity of earth; this depending upon the condition of theſe earths, their richneſs, and the quantity of nitre, with an earthy baſis that they contain; and, in ſhort, upon many other circumſtances which it

is

is impoſſible to foreſee. We can only, therefore, lay down ſuch rules as may enable the ſaltpetre maker to judge, what quantity of pot-aſh he ought to employ, according to the ſtate in which he finds theſe earths.

For this purpoſe, let him diſſolve one part of pot-aſh in two parts of water, and either filter the liquor, or let it ſtand till it is clear, and ſet this ſolution aſide.

Let him then elixiviate ſome very pure nitrous earth in three or four times its weight of water, and ſet this lixivium likewiſe aſide; and if, upon dropping ſome of the ſolution of pot aſh into a glaſs of his ley, he finds the latter grows whitiſh or muddy, he may be aſſured that the precipitation of the earth is not completed, and conſequently, that a ſufficient quantity of pot-aſh has not been employed. If, on the other hand, the ley remains untroubled, let him drop in ſome of the lixivium drawn from the nitrous earth, upon which, if the pot-aſh is in too great a quantity, it will likewiſe turn muddy. Upon the whole, if, in neither of theſe caſes, the liquor is diſturbed, we may be aſſured the pot-aſh has been employed in a juſt proportion.

In general it is better to uſe too little than too much pot-aſh. When too little is employed, it is true, part of the nitre, with an earthy baſis, will not be decompoſed, but it will be found in the mother-water after cryſtallization; and when

when a large quantity is collected it may be elixiviated ſeparately.

Inſtead of uſing pot-aſh in ſubſtance, it may be diſſolved in a given quantity of water; for inſtance, one pound of pot-aſh in two pounds of water, and three pounds of this liquor uſed in the room of one pound of pot-aſh.

The French miniſtry are ſo deſirous of bringing pot-aſh into uſe, being ſenſible of the great advantages that muſt reſult from it, that they have ordered the *Regiſtres des poudres*, to furniſh the ſaltpetre makers, and others who may be inclined to take up this buſineſs with this article, and to take care that it is of the beſt quality. Thus far the authors, who have ſet their names to this little piece, who are no other than Meſſrs. Macquer, Lavoiſier, D'Arey, Cadet, and Sage.

It is certain, that by percolating a fixt alkaline ſolution through a nitrous earth, *duly matured*, the ſame kind of ley may be obtained with that in common uſe among the ſaltpetre makers; and that a ſolution of pot-aſh, of ſome kinds, if not of all, may anſwer this end; but we cannot approve of uſing it in ſubſtance, as is here recommended. By diſſolving it in water, and weighing it, we can know the exact quantity of fixt alkali we employ, and may with great eaſe increaſe or diminiſh it, as we ſee occaſion.

The

The value of foreign pot-aſh is no where better known than in England, there being, perhaps, no part of the world in which there is a greater conſumption of it, nor which is ſupplied with it upon cheaper terms; which circumſtance muſt ſtrongly recommend its uſe.

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*An Attempt to ſhew, that a* TASTE *for the* BEAUTIES *of* NATURE *and the fine Arts, has no* INFLUENCE *favourable to* MORALS. *By the Rev.* SAMUEL HALL, A. M. *Read May* 15, 1782.

Nullius addictus jurare in verba magiſtri.
HOR. Ep. I. Lib. I.

Scilicet uni æquus virtuti.
HOR. Sat. I. Lib. I.

THE Society, which I have now the honour to addreſs, has lately been preſented with ſeveral ingenious papers on TASTE. It may, therefore, be thought neceſſary to make an apology, for bringing forward a ſubject, which has been already ſo well inveſtigated.

Were I to purſue the track of thoſe who have gone before, it would be the higheſt preſumption to ſuppoſe, that any obſervations I could make, would be deſerving attention. It would be to offer

offer the Society a few ſcanty gleanings, after the full harveſt had been gathered in. But I have no deſign to invade the province of another. I ſhall neither examine the principles, on which taſte is founded; nor enquire, whether it is more the child of nature, or of education, or the joint product of both. I ſhall confine my remarks to the EFFECTS which TASTE, however produced, may be ſuppoſed to have on the MORAL CHARACTER; and ſhall endeavour to ſhew, that its influence on the heart, is not favourable to virtue.

A diſtinguiſhed Member of this Society, in whom the Scholar and the Gentleman are moſt happily united, has, in an elegant paper,* ſupported the reverſe of this propoſition; which, it muſt be owned, is no ſingular opinion. It is maintained by very high authorities in the literary world; particularly, by LORD KAIMS, in his *Elements of Criticiſm*; by GERARD, in his *Eſſay on Taſte*; and indeed, by many others, who have profeſſedly treated on this ſubject. It may, perhaps, be the prevailing and popular opinion of the preſent day. But are we thence to conclude, that it is founded in truth? Doctrines are ſometimes faſhioned "to the varying

* The Paper here alluded to has been publiſhed, ſince it was read to the Society, in the volume of Moral Diſſertations, by T. Percival, M. D. &c.

hour;"

hour;" and many popular opinions are governed by no better motive, than fancy or caprice.

To me, I own, it does not appear ſurpriſing, that writers on taſte have generally been led to ſuppoſe, that its influence muſt be friendly to virtue. When a ſubject has been long contemplated, the mind becomes, in ſome meaſure, enamoured of it, views it with complacency, and, from an over-weening fondneſs, beſtows attributes and perfections, which are not naturally its own. How often has this been the caſe, with ſome new diſcovery in philoſophy! Its ingenious advocate is ſeldom willing to confine its effects, to the rank it juſtly holds. He would have it conſidered, not only as a law of nature, operating in its proper ſphere; but as a great and *univerſal* cauſe, to which all other cauſes muſt be ſubordinate; and will even attempt to ſolve all the phenomena of nature by its means. Thus, ELECTRICITY was lately a favourite theory, which, for a while, ſeemed to bid fair for univerſal empire in the philoſophical world. And thus, ſome uſeful diſcoveries in medicine have been raſhly exalted into panaceas, or univerſal remedies. The ſame ſpecies of enthuſiaſm *has, indeed,* at different periods, prevailed in every ſcience. Hence, the vaſt variety of new theories, and ſyſtems, which have ſprung up; and for awhile amuſed the world, and which have, at length, yielded their

uſurpation to ſome new conqueror, which will probably be equally ſhort-lived.

But to return from this digreſſion. The advocates for the influence of Taſte on the Moral Character, have generally confounded that faculty with the MORAL SENSE. They ſeem to be perſuaded, that the ſame power, which diſcovers, and reliſhes the beauties of nature and of art, muſt equally diſcover, and reliſh the beauty, the order, the harmony of virtue. Lord SHAFTESBURY * has fully adopted this notion. His diſciciple HUTCHESON, † with ſome trifling diſtinctions, has embraced the ſame opinion. The very ingenious author of the *Elements of Criticiſm* tells us, that there is a ſtrong and cloſe affinity between taſte, and the moral ſenſe. "Taſte, ſays he, in the fine arts, goes hand in hand with the moral ſenſe, to which indeed it is nearly allied." ‡

This natural connection, and cloſe alliance, of taſte with the moral ſenſe, may, perhaps, be very juſtly diſputed; as taſte, I apprehend, muſt be the joint reſult of delicate, corporeal, and intellectual powers; whilſt what is uſually underſtood by a moral ſenſe, muſt be of a nature altogether intellectual.

* Lord Shafteſbury's Characteriſtics paſſim.

† Hutcheſon's Inquiry into the Orig. of our Ideas of Beauty, &c.

‡ Elem. Crit. Introduc. p. 7.

But

But let us, for a moment, ſuppoſe that ſuch an union is really eſtabliſhed; and that taſte can take cognizance of the merit or demerit of actions, with the ſame eaſe and preciſion, that it pronounces on the abilities of the ſtatuary, or of the painter. Will it neceſſarily follow, that ſuch a taſte muſt always be productive of a virtuous conduct? It will not be diſputed,* that taſte generally operates in ſome favourite direction. It does not embrace all the beauties of nature, or of art, with equal reliſh; nor explore every ſcience, even of thoſe eſteemed elegant and refined, with the ſame keenneſs of diſcernment. The painter is not always poſſeſſed of an ear finely tuned to muſic; nor the muſician always delighted with the elegance and vigour of poetical compoſition. Nature ſeldom produces an accompliſhed maſter, unleſs her efforts have been directed to one particular object. And in vain would be the attempt to riſe to excellence, in any art or ſcience, ſave that, which is congenial to the taſte. Some men, indeed, ſeem to be poſſeſſed of, what may be termed, a general taſte; and are capable of, at leaſt, moderate attainments in every branch. But taſte, like every other energy, perhaps is weaker, in proportion as it is diffuſed.

* Brown's Eſſays on the Characteriſtics, Sect. II. 8.

Upon this ſuppoſition, it is evident, a man may have an exquiſite taſte for ſome particular art or ſcience, and yet, no taſte for virtue. To this ſpecies of beauty the faculty may be ſo little ſenſible, as to produce no effects. In ſuch a caſe, virtue only ſhares the fate of many other things, which are confeſſedly objects of taſte, and which are rejected, becauſe the capacity adapted to them is ſo weak, that it may be ſaid to be wanting.

But let us ſuppoſe, that taſte really exerciſes ſome of the privileges and powers of the moral ſenſe. The advocates for its practical influence would not gain much, by this very ample conceſſion. The mere ſenſe of the beauty of virtue (and it is not pretended, that any thing further can be the object of taſte) abſtracted from every other conſideration, will ſcarcely be thought ſufficient to ſupport her cauſe. The theory appears more ſpecious, than ſolid; more pleaſing, than efficacious. When dreſſed with the art, the ingenuity, and the eloquence of a Shafteſbury, it may entertain and amuſe, the heart being ſuppoſed in a ſtate of eaſe, calm and indifferent. But its effects will not be ſufficiently ſtrong with the generality of mankind, to ſpur them on to action. We ſurvey the lovely picture, are convinced that it is a fine one, yet turn aſide to ſome other object, that agitates our hopes and fears

The

The doctrine may, probably, ſuit the retired temper of the philoſopher, or the apathy of the ſtoic: but is ill calculated for "the buſy haunts of men," and the tumults of ſocial life. The man of taſte admires the beauty and expreſſion exhibited in the works of a Raphael, or a Michael Angelo, without feeling the ſlighteſt wiſh to become an artiſt, and to rival theſe great maſters. May he not, in like manner, view the charms of virtue, and of a moral conduct, without making one ſingle effort to become a moraliſt, or a virtuous man?

I ſhould imagine it impoſſible for any perſon, poſſeſſed of the leaſt ſenſibility, to read the character of Sir C. Grandiſon, drawn with ſo much delicacy by Richardſon, and not admire and approve, the elegance of manners and purity of morals, with which he has adorned his hero. But is it certain, that he will beſtow more than his approbation? Will he entertain a ſingle thought, of copying the amiable portrait? To admire and reverence virtue, is a tribute extorted even from vice. The moſt profligate, and wicked characters experience a ſecret conſciouſneſs, that every preference is due to virtue; and are not inſenſible to her ſuperior lovelineſs. But does this ſenſe operate on the mind, with ſufficient force, to influence, or to reclaim? *Video meliora proboque deteriora ſequor*, muſt be the language of every ſinner, whoſe faculties are not utterly depraved.

"It is a remarkable circumſtance, ſays BROWN in his *Eſſay on the Characterics*,* that, in the decline of both the Greek and Roman ſtates, when religion had loſt its credit and efficacy, this very taſte, this ſpecies of philoſophy, uſurped its place, and became the common ſtudy and amuſement both of the vile and vulgar." Quintilian, no doubt, had a view to this, in the following paſſage. *Nunc autem, quæ vel ut propria philoſophiæ aſſeruntur, paſſim tractamus omnes. Quis enim modo de* juſto, æquo, *ac* bono, *non et vir peſſimus loquitur?*

The truth ſeems to be, that a mere ſenſe of the beauty of virtue cannot operate, as a coercive power;† and, however the theory may pleaſe the reaſoner in the ſhade, when the paſſions ſtagnate without impulſe, and the appetites are ſecluded from their objects, it will be of little force, againſt the ardor of deſire, or the vehemence of rage; amidſt the pleaſures, or conflicts of the world. To counteract the power of temptations, hope muſt be excited by the proſpect of rewards, and fear, by the expectation of puniſhment. In a word, virtue may owe her panegyric to a Plato, or a Shafteſbury, but muſt derive her efficacy and authority, from religion.

From what has been advanced, it appears to me extremely evident, that, ſuppoſing taſte were

* Eſſay II. Sect. 10.

† See the Preface to the Preceptor, by Dr. Johnſon.

conſidered,

conſidered, not only as connected with, but even advanced to the rank of, the moral ſenſe, its influence on the heart would be too faint and languid, to produce any moral effects. The charms of virtue* may be ſeen with the eye of ſpeculation, without exciting in us a deſire of becoming virtuous; juſt as an excellent picture, or fine proſpect, may afford us very conſiderable pleaſure, and yet produce not a ſingle wiſh to diſpoſſeſs the owners, and to make them ours. And though it may be ſuppoſed, that a ſenſe of the charms of virtue muſt naturally give us a prejudice in her favour; yet, Will this prejudice be ſufficient to keep us ſteady to her intereſts, when Vice ſteps forth, attired with every ſeductive ornament of taſte, that can win the affections; and engages the ſtrongeſt paſſions of the heart, as advocates in her favour?

But we are told, that "taſte naturally ſweetens and harmonizes the temper, and reſtrains the turbulence of paſſion, and violence of purſuit."† On this ſuppoſition, the beauty of virtue may have conſiderable effects on

* "Our ſenſe of beauty from objects by which they are conſtituted good to us, is very diſtinct from the deſire of them, when they are thus conſtituted."

HUTCHESON's Inquiry, &c.

† Elements of Criticiſm. Introduct. page 11. Percival on a Taſte for the Beauties of Nature.

a mind, already diſpoſed, by calmneſs and compoſure, to yield to the gentleſt influence.

This reaſoning will not eaſily be ſupported by experience, and matter of fact. The connection between *genius* and *taſte* is ſo common, that they may almoſt be conſidered, as inſeparable companions. Genius without taſte, would be no better than frenzy: and taſte, without genius, would be diſtinguiſhed for nothing, but a lifeleſs accuracy. But genius, it is generally agreed, is united to a warm and inflammable conſtitution. "If," ſays an eminent critic, "the imagination be lively, the paſſions will be ſtrong; true genius ſeldom reſides in a cold and phlegmatic conſtitution. The ſame temperament, and the ſame ſenſibility, that makes a poet or a painter, will be apt to make a man a lover, and a debauchee."* Theſe propenſities of nature may be reſtrained by the dictates of reaſon, and eſpecially, by the awful ſanctions of religion; and thus, genius and virtue may unite, and adorn the ſame perſon. But in vain ſhall we look for theſe important effects, from the influence of taſte. In vain ſhall we expect to find, that men of genius and of taſte will be always diſtinguiſhed, for the ſweetneſs of their tempers, and the purity of their morals. The irritability of

* Warton's Eſſay on the Writings and Genius of Pope. Vol. I. p. 105.

a POPE

a POPE, and a GRAY; and the voluptuouſneſs of a MONTAGUE, and a CHESTERFIELD, may be adduced as inſtances, amongſt numberleſs others, of the truth of what has been advanced.

But we are further told, "that a taſte for the beautiful ſcenes of nature, not only compoſes and harmonizes the temper, but diſpoſes the mind to acts of piety and devotion, by raiſing our ideas from Nature, to Nature's God."* The thought is pleaſing, and ingenious; but muſt not be admitted, without many exceptions. The impreſſions made by the beauties of nature, will greatly depend on the paſſions, the habits, and the purſuits of the beholder. Let the muſician take the "wildly devious walk," his notice will probably be attracted by the melody of the grove, as moſt nearly related to his favourite art. The eye of the Painter will be engaged, by the rich landſcape that lies before him; and his thoughts will be naturally turned to the effect which might be produced, by a lively tranſcript on canvas, of ſo pictureſque a ſcene. While the Poet, however ſtruck by the grandeur or elegance of ſurrounding objects, will only meditate, how they would "live in deſcription, and look green in ſong." It is the calm contemplative mind alone, influenced by religious impreſſions, that ſurveys this fair heritage, with

* Perçival on a Taſte for the Beauties of Nature.

pious

pious and grateful ſentiments towards the almighty Creator. A mind thus happily diſpoſed, in the animated language of Shakeſpeare,

> "Finds tongues in trees, books in the running brooks,
> Sermons in ſtones, and good in every thing."

I ſhall now mention a few inſtances, where taſte ſeems to be productive of misfortune, and immorality. We frequently ſee a man of real and acknowledge taſte, run into all the folly, and extravagance of virtue. It is not ſufficient for him, that he may be regaled with the productions of art and genius, in the poſſeſſion of another. A man of this unhappy turn, feels a reſtleſs deſire to call them his own. He is perpetually in queſt of ſome new object; but his unfortunate paſſion grows more violent by indulgence; and, however a new acquiſition may gratify for the moment; yet, in the end, it becomes the ſource of freſh diſquiet. Thus, like Pope's Curio, who,

> - - - - - - - - "Reſtleſs by his fair one's ſide,
> Sighs for an Otho, and neglects his bride:"

He is perpetually haunted by the demon of taſte; his mind becomes fretful, peeviſh, and diſſatisfied; equally incapable of giving, or receiving ſatisfaction. But, ſhould his circumſtances be contracted, the conſequences are dreadful indeed! He involves his deareſt connections in all the miſeries of poverty.

"The

" The bailiffs come, rude men, profanely bold,
And bid him turn his Venus into gold.
No Sirs!" he cries, " I'll ſooner rot in jail!
Shall Grecian arts be truck'd for Engliſh bail?
Such heads might make their very buſtos laugh:
His daughter ſtarves: but Cleopatra's ſafe." *

Another is betrayed into a conduct equally ridiculous and fatal, by a taſte for the elegances of life, and domeſtic refinements. Fancy is ever ready to ſuggeſt ſome new plan to be executed, or improvement to be made. The houſe is capable of ſtill higher embelliſhments; and the garden may be laid out, in a manner more beautiful. He complies with the ſuggeſtions of his refined taſte—involves himſelf in difficulties—and is at length ruined.

The malady of a third is, an exceſſive and ſickly kind of delicacy. His feelings are ſo nice, and his ideas ſo refined, that he is irritated and vexed with every trifle. He is not only affected

- - - - - - - - - - - - - - - " with quick diſguſt,
From things deform'd, or diſarranged, or groſs
In ſpecies." †

Even thoſe objects, which to others afford very conſiderable pleaſure, are ſeen by him, with a joyleſs indifference. But, indeed, almoſt every avenue to enjoyment is ſhut up, by this unhappy

* Young's Satires.

† Akenſide's Pleaſures of Imagination.

diſeaſe.

diſeaſe. Yet he nurſes it with the greateſt aſſiduity; fancies himſelf formed of nature's fineſt clay; and looks with contempt, on the coarſe delights of his fellow-creatures. By degrees, he becomes unfit for the common duties of life, and is cut off from the bleſſings, and advantages of ſocial intercourſe.

But we need not appeal to a few inſtances of individuals. The prevailing manners of whole nations may be brought in proof, that taſte has no influence favourable to virtue. It is ſcarcely neceſſary to remark, that Athens was once the ſeat of learning, taſte, and refinement. The liberal arts were cultivated with the greateſt care and attention, and roſe to a pitch of perfection, which has been generally imitated, but never excelled. A taſte for elegance was ſo univerſally diffuſed among all ranks of people, that even a herb-woman, we are told, could detect a very ſmall deviation from propriety of ſpeech.* Taſte could not poſſibly have a fairer, field, wherein to diſplay its natural effects. But the hiſtory † of thoſe times, and the moral lectures of Socrates, ſufficiently evince, that the Athenians were a people, addicted to every kind of ſenſual pleaſure: at once, refined and voluptuous, licentious and effeminate.

* Xenoph. Memorab. paſſim.

† Rollin's Antient Hiſtory, vol. IV.

When

When a taſte for the liberal arts was introduced among the Romans, with the rich ſpoils of Grecian elegance and ingenuity, can we diſcover in the hiſtory of that wonderful people, a conſequent improvement in the habits of virtue? You will ſay, perhaps, their rugged tempers were ſoftened, and their auſtere manners refined. But refinement is often remote from virtue; and external graces unconnected with internal beauties. It is true, they improved in all the elegances of life; but it is equally true, that their native vigour degenerated into unmanly ſloth; and the *Amor Patriæ*, which had carried the Roman name ſo high, was ſucceeded by a mean and abject ſelfiſhneſs*. Cato ſeems to have been well aware, that a taſte for the enervating arts of Greece, would be productive of theſe miſchievous effects†; and endeavoured by every means in his power, to ward off the threatened evil. But in vain was every remonſtrance. A rage for the beautiful productions of genius univerſally prevailed, and bore down all oppoſition. And we find the latter Cato, in one of his ſpeeches recorded by Salluſt, reproaching his countrymen, in the following warm expreſſions: *Per Deos immortales, vos ego appello: qui ſemper Domos,*

* Græcia capta ferum victorem cepit.
Hor. Epiſ. Lib. II.

† Liv. Lib. 34. C. 4.

*Villas,*

*Villas, Signa, Tabulas veſtras, pluris quam rempublicam feciſtis* *:

Let me now call your attention to a much later period of hiſtory, when taſte revived, in the fifteenth century, after a long and gloomy night of Gothic ignorance and barbarity. Foſtered by the favour and liberality of the princes of the MEDICI family, literature and the arts made a rapid progreſs. But it does not appear, that moral duties made equal advances, or were more generally cultivated. Obſerve, in what unfavourable colours, the characters of theſe Medici, the great patrons of genius and learning, are drawn by Lord ORRERY, in his *Letters from Italy*, "If," ſays he, "you take a view of the princes of the Medici, in a group, you will feel reverence and reſpect, at one part of the picture, and be ſtruck with horror and amazement, at the remainder. To revere and honour them, you muſt conſider their generoſity, their benefactions to men of learning, their policy, and ſcientific inſtitutions. To view them with horror and amazement, you need only liſten to the undoubted outrages of their private lives; by which you will be convinced, that few or none of the whole race were endued with the ſofter paſſions of the human ſoul. I wiſh, that in many of their group, their love

* Salluſt. Bell. Catilinar.

was

was not luſt; their good nature, oſtentation; their dignity, pride; and their ſenſe, cunning."

From theſe, and numberleſs inſtances of refined depravity, which modern times will furniſh, one might almoſt be tempted to conclude, that the effects of taſte are ſo far from being favourable to virtue, that they have rather a pernicious tendency. But I mean not to bring ſuch a heavy charge againſt a faculty, which, connected with reaſon and religion, will, doubtleſs, enlarge the ſphere of our innocent enjoyments. I wiſh only to diſprove the affirmative of the propoſition, and ſhew, that taſte cannot reaſonably be conſidered as a moral principle of action: that, unaſſiſted by reaſon and good ſenſe, it becomes ſubſervient to the purpoſes of folly and extravagance; and that, connected with a baſe and ſenſual heart, it unhappily ſerves to embelliſh guilt, and gloſs over the deformity of vice.

Let taſte, however, be cultivated, as the ſource of many elegant pleaſures: but let it ever be cultivated, in ſubordination to ſound morality. Taſte can ill ſupply the want of moral diſcipline. Where there is no ſuperior principle, to check the aſſaults of an alluring temptation, the heart muſt fall an eaſy prey. A truly virtuous character, ſet off by a juſt taſte, is not only engaging, but even beneficial to mankind: while, on the contrary, a vicious character, however diſtinguiſhed for taſte and elegance, becomes only,

the

the more finiſhed hypocrite, or the more exquiſite voluptuary. In a word, let virtue form the baſe and the ſhaft of the column; and I have not the leaſt objection, that taſte ſhould furniſh the foliage, and ornament the capital.

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## Observations *on the* Use *of* Acids *in* bleaching *of* Linen. *By Dr.* Eason. *Read Auguſt 7,* 1782.

THE uſe of acids, in bleaching of linen, has been long known. Formerly milk was chiefly employed; but it had ſeveral inconveniences. The quantity requiſite could ſcarcely be obtained; its effect was ſlow; and, containing animal matter, it was apt to rot and ſpoil the cloth.

About thirty years ago, it was diſcovered, that the foſſil acids, when properly diluted with water, anſwered much better, and would do more in a few hours, than animal acids could do in a week, in facilitating the whitening of cloth.

At firſt, it was imagined, that the mineral acids would be apt to burn, or corrode linen ſubſtances, when immerſed in them. But experience ſoon diſpelled ſuch fears, and convinced bleachers,

bleachers, that, by proper management, the danger was next to none.

According to the ſtrength of the acids they muſt be mixed with water, ſometimes, to ſeven hundred times their bulk.

The nitrous acid, being the moſt corroſive, and moſt expenſive, has not been uſed.

The vitriolic acid is that which has univerſally been employed: not becauſe it is preferable to the muriatic acid, but becauſe it was to be bought in large quantities, and at a ſmall expence.

The muriatic acid being now ſold nearly as cheap as the vitriolic, and anſwering in a ſuperior degree, will, in a ſhort time, I am convinced, be generally adopted by bleachers.

As I muſt confeſs my ignorance in the art of bleaching, it may ſeem preſumptuous in me to hazard a conjecture concerning the manner in which acids act in whitening cloth; but it ſeems probable, that alkaline ſalts, which are uſed in waſhing out the oil and glutinous parts of flax, on which the green colour depends, depoſite an earth, in the pores of the cloth. As it is known that acids will alſo diſſolve the earthy parts of vegetables, that acid ſhould be preferred, which will keep earthy particles ſuſpended in water. The vitriolic, therefore, is not ſo proper; becauſe, with earthy ſubſtances, it forms immediately a ſelenite;

a ſubſtance only ſoluble, in a very large quantity of water. This ſelenitic matter, adhering to the threads of the cloth, will injure it, and make it feel hard to the touch, and probably is the reaſon, why ſome linens wear ſo badly.

When the muriatic acid is uſed, no ſelenite is formed. Whatever quantity of earthy matter is diſſolved by it, is eaſily waſhed out by pure ſoft water, and the cloth having a ſoft ſilky feel ſeems to ſtrengthen this conjecture.

As the muriatic acid is now ſold at three-pence per pound, and the common vitriolic acid at four-pence halfpenny, and as the muriatic acid will, in proportion, acidulate a larger quantity of water than the vitriolic, beſides the great probability of its anſwering better in whitening of cloth, the bleachers in this part of the world would do well to give it a fair trial.

*Conjectural*

*Conjectural* REMARKS *on the* SYMBOLS *or* CHARACTERS, *employed by* ASTRONOMERS, *to repreſent the ſeveral* PLANETS, *and by the* CHEMISTS, *to expreſs the ſeveral* METALS, *in a* LETTER *to* THOMAS PERCIVAL, M. D. F. R. S. &c. *By* MARTIN WALL, M. D. *Prælector of Chemiſtry in the Univerſity of Oxford. Read October* 9, 1782.

SIR,

I AM extremely apprehenſive, leſt the following obſervations, as relating to a ſubject more ſpeculative than uſeful, may be thought unworthy of the attention of your very reſpectable Society; yet, deſirous to ſhew my juſt ſenſe of the compliment, which you have paid me, by propoſing me as an honorary member, I advance them with great deference, hoping you will ſuppreſs them entirely, if they ſhould not meet the approbation of your correct judgment.

Whoever engages in the ſtudy of Chemiſtry, cannot but remark, with ſome degree of curioſity, how extenſively the uſe of ſymbols or characters has prevailed in this ſcience; and is naturally led to enquire, from whence this practice originated, and whether the characters uſed are merely arbitrary, or have any relation, real or

imaginary, to the ſubſtances which they are employed to repreſent. That many of them are entirely arbitrary, is commonly ſuppoſed by thoſe, whoſe knowledge of chemical authors is only ſlight and ſuperficial; but the enthuſiaſm of a few, whoſe reading has been more extenſive, ſuggeſts a different idea. Every character is, by theſe, conceived to convey an accurate deſcription of the qualities of the ſubſtance, which it repreſents. It is hardly neceſſary to obſerve, that this opinion is not indirectly ſupported by *Boerhaave*, and his commentator *Shaw**: and Dr. *Price* † in his account of his extraordinary experiments on mercury, ſilver and gold, aſſerts, that the ancient chemiſts either knew or believed, that the imperfect metals had a ſaline principle, which they denoted by a croſs attached to their characters. It is impoſſible, perhaps, to advance very far in our enquiries into this ſubject; yet ſome little light may be thrown upon it, by a due attention to thoſe characters, which are above alluded to, thoſe by which the metals are repreſented. And firſt, it cannot but appear very ſtriking, that the ſymbols employed to repreſent the ſeven metals, which alone were known in the earlier ages, are the ſame, as thoſe which were applied by the firſt aſtronomers, to denote the ſeven planets. The chemiſts have, in gene-

* *Shaw's Boerhaave*, vol. I. p. 68.

† *Price's Experiments* on Mercury, &c. Preface, p. 11.

ral,

ral, arrogated to themſelves the prior right to theſe characters, upon the pretence, that they point out moſt accurately the various qualities of the metals; whereas, to the planets they have no kind of relation. Yet, notwithſtanding the plauſibility of their arguments, I am inclined to entertain a contrary opinion, and to believe that the pretenſions of the Aſtronomers have a better foundation.

Aſtronomy was cultivated in all the oriental nations, particularly in Ægypt, Phœnicia and Chaldea, in the very earlieſt ages, of which we have any record. Not only the uniform appearances of the fixed ſtars, but even the more irregular movements and revolutions of the planets, and the peculiar circumſtances of colour and ſplendour, by which they are diſtinguiſhed from each other, were accurately marked and obſerved.

In the ſame period of time, the opinion of polytheiſm had been gradually diſſeminated: and it was extremely natural, that thoſe ſplendid bodies rolling apparently above the earth, in the immenſity of ſpace, by ſuch determined laws, ſhould be conſidered as the habitations of the immortal beings, by whoſe immediate influence and ſuperintendence the affairs of the world were conducted.

Having premiſed this, let us now, for the farther inveſtigation of this ſubject, pay a particular

attention to the Mythology of Ægypt, which opens an important fund of information, with reſpect to the hiſtory of religion and ſcience, in thoſe early periods: but we muſt not expect to find the path free from obſcurity and difficulty.

In that country, the hieroglyphic mode of writing was uſed in the greateſt extent, and was connected not only with the ſciences, but even with religion. By this learned people a circle was employed to denote perfection, and particularly the infinite perfection of the Supreme Being, their *Oſiris*, whoſe reſidence they conceived to be in the great luminary of the day, from whence he diſtributed the bleſſings of light and heat, to animate the univerſe. Hence, by a very eaſy and obvious application, a circle came alſo to be employed, as the hieroglyphic of the ſun.

The form of the creſcent moon naturally pointed out the ſymbol, by which ſhe has always been repreſented: nor was this planet deſtitute of a divine inhabitant; but was ſuppoſed to be the palace of the Queen of Heaven, the wife of Oſiris, the common mother of mankind. *

* ---------- Imitataque Lunam
Cornua fulſerunt ---------
Says Ovid of the Ægyptian Iſis. Met. Lib. IX. 782.

That, the idea of the wife of the Supreme Being preſiding over the moon, was afterward introduced into Greece, appears from a beautiful Medallion of the Samian Juno in Mr. Bryant, vol. II. Pl. 12.

To

To explain the remainder of the aſtronomical ſymbols, upon the ſame principle, it is neceſſary previouſly to remark, that polytheiſm in its pureſt form, is nothing more than the deification of particular attributes of the Supreme Being, ariſing from the infirmity of human nature, unequal to the comprehenſion of one all perfect Being. Hence we are not ſurprized to find, that the two planets diſtinguiſhed by a ſplendor, next to that of the ſun and moon, were alſo ſuppoſed to be inhabited by, or at leaſt conſecrated to the ſervice of the two chief Deities, under a different form and name.

One of theſe planets is known by the title of Jupiter, and probably derived both its appellation and its ſymbol, from that part of the Ægyptian mythology, which aſſerted, that when the gods, in the war with the giants, fled from the wrath of Typhor into Ægypt, they concealed themſelves in the ſhapes of various beaſts, under which they were afterwards worſhipped, and particularly Jupiter under that of a ram, at the celebrated Libyan Temple of Jupiter Hammon. To this circumſtance *Lucan* alludes, in his deſcription of the march of Cato through the wilds of Africa;* and Ovid, more diſtinctly, in his ac-

* Ventum erat ad Templum, Libycis quod Gentibus unum
Inculti Garamantes habent: ſtat certior illic
Jupiter, ut memorant, ſed non aut Fulmina vibrans,
Aut ſimilis noſtro, ſed tortis Cornibus, Hammon.
*Luc.* Pharſ. L. IX. 511.

count of the wars of the Gods.* This image of Jupiter was not confined ſolely to the Libyan temple, as we find from ſome paſſages in Herodotus,† and many remains of Ægyptian ſuperſtition which are ſtill preſerved.‡ As Jupiter, therefore, was ſo frequently worſhipped under the form of a ram, or a figure with a ram's head, or at leaſt wearing the horns of a ram, it is not improbable, that the ſymbol of this planet was taken from theſe images. It might originally be the perfect head of a ram, or only one horn. The croſs annexed to it *(ſee fig.* 1. *in the plate)* may be an imperfect remainder of the outline of the head of the ram, or with more probability we may imagine, that it was originally annexed

* Bella canit ſuperûm : falſoque in Honore Gigantas
Ponit, et extenuat magnorum Facta Deorum,
Emiſſumque ima de ſede Typhoëa terræ
Cælitibus feciſſe metum, cunctoſq dediſſe
Terga fugæ : donec feſſos Ægyptia tellus
Ceperit, & ſeptem diſcretus in Oſtia Nilus.
Huc quoque terrigenam veniſſe Typhoëa narrat,
Et ſe mentitis ſuperos celaſſe figuris :
Duxque gregis, dixit, fit Jupiter ; unde recurvis
Nuncquoque formatus Libys eſt cum Cornibus Hammon.
*Ovid.* Met. V. 319.

† *Herod.* Euterp. 42.

‡ See a beautiful engraving from a Medallian, repreſenting *Helius Serepis* in Mr. *Bryant*'s Mythology, vol. II. Pl. 12. and ſix preſentations of *Jupiter Hammon* in *Montfaucon*'s Antiquities, Pl. 14. Tom. I.

to

to convey ſome particular information, and was afterwards retained in the figure, though the intention of its firſt application was forgotten.

The Ægyptians, we are told,* expreſſed the different ſtages of the inundation of the Nile, by expoſing columns or poles, with one or more croſſes upon them: and this croſs was ſometimes connected with other ſymbols, to denote ſome other circumſtance, either of the ſeaſon or ſituation of the planets, which concurred with the inundation. Hence, we ſee it annexed, not only to this ſymbol of Jupiter, but alſo to that of Venus, Saturn, and Mercury.

As Jupiter was repreſented under this form, it became common in after-times for great princes, who wiſhed to be conſidered as his deſcendants, or whoſe ambition led them to aſpire to deification, to aſſume the ſame mark of diſtinction in their medals and ſtatues, as we ſee frequently in thoſe of Alexander the Great, and his ſucceſſors, particularly the Seleucidæ and the Ptolemies. Hence to it was adopted by Marc Anthony, when his extravagant attachment to the Ægyptian Queen prevailed upon him, to relinquiſh the Roman dreſs and manners, and to aſſume the habits and inſignia of honour, uſed by the eaſtern nations.† As this practice pre-

* L'Hiſtoire du Ciel par *l'Abbe Pluche*, Ch. I. §. 8.

† *Cooke*'s Medallic Hiſtory of Imperial Rome, vol. I. Pl. 7. Fig. 11, 12, 16.

vailed

vailed very extenſively in the eaſt, may not thoſe metaphorical expreſſions, relative to temporal greatneſs and dignity, ſo frequently occurring in the oriental languages, and in the Sacred Scriptures, have been derived from thence, viz. *Thou haſt lifted up my* horn; *my horn ſhall be exalted* &c. &c. &c. &c?

That brilliant planet, which we call *Venus*, was alſo conſidered by the Ægptians, as ſacred to the Queen of Heaven, who, by them, was known by the name of Iſis, and in different countries by almoſt innumerable different appellations. It would lead me very far into the depths of mythology, to prove that the Goddeſs, intended by all theſe appellations, was the ſame, and that the Iſis of the Ægyptians was the Venus of the Greeks and Romans. * To thoſe who are converſant with ſtudies of this nature, hardly any proof is neceſſary. Accordingly, it may be ſuppoſed, that the aſtronomers aſſumed, as the ſymbol of this planet, the *Siſtrum* of Iſis, which we are told by antiquarians, † was a ſmall oblong circle of metal, croſſed by iron rods, with a handle (as in fig. 2. of the plate) by which it might be held; and that it was uſed

* See *Montfaucon*'s Antiq. Part II. B. II. Ch. 2. and *L'Abbe Pluche* Hiſt. des Ciels. Ch. II. §. 3, 11, 12, 13, 14, 15.

† See *Montfaucon*'s Ant. Tom. II. p. 287. & *Abbe Fluche* Hiſt. des Ciels, &c. Ch. II. §. 3. & Pl. 17.

at

at feaſts, to point out, by exact cadences, the movements of the ſongs and dances. There might be, therefore, a peculiar propriety in aſſuming this inſtrument, as the ſymbol of that planet, which was ſuppoſed to be peculiarly favoured by the reſidence of the Goddeſs of mirth and love; and ſo often appears in its greateſt ſplendour and beauty, in thoſe evening hours, when the heat, the hurry and labours of the day, give place to coolneſs, tranquillity and peace, or to mirth and joy, the ſong and the dance *.

The

* The Roman Poets have many beautiful alluſions to the pleaſures which attend the riſing of the *evening ſtar*.

- - - - - - - - - Cum frigidus aera *Veſper*
Temperat, & Saltus reficit jam roſcida Luna,
Littoraque; halcyonem reſonant, & acanthida dumi.
*Virg.* G. III. 336.

*Veneriſque* ſalubre Sidus. *Lucan Pharſ.* Lib. I. 661.

*Veſper* adeſt, Juvenes, conſurgite; *Veſper* Olympo
Expectata diu vix tandem Lumina tollit;
Surgere jam tempus. *Catulli* Caren Nupt. I.

*Heſpere*, qui Cælo lucet jucundior Ignis?
Qui deſponſa tua firmes connubia flamma
Quæ pepigere Viri, pepigerunt ante Parentes,
Nec junxere prius, quam ſe tuus extulit ardor.
Quid datur a Divis felici optatius Hora. Id. V. 24.

It is well known that this planet is often a *morning* ſtar. Virgil has given a charming deſcription of her riſing in this ſtation, and has taken particular pains to point her out, as the favourite of the goddeſs Venus.

Qualis

The ſlow movement of that planet, which is called *Saturn*, would naturally ſuggeſt, that he was under the patronage of ſome Deity, diſtinguiſhed by ſuperior gravity and wiſdom; and thence it was ſuppoſed to be the reſidence of the moſt ancient of the Gods, or time itſelf. Hence, as its ſymbol, they aſſumed the ſcythe, or the ſickle, the particular attribute of that Deity. (See fig. 3. in the drawing). He is expreſsly called by *Ovid*, *Falcifer Deus*, (Faſtor, lib. I. 233.) and *Juvenal* ſays that he aſſumed the ſickle, when he was deprived of the imperial crown, by his ſon Jupiter.

> ---------- prinſquam
> Sumſerit agreſtem, poſito Diademate, falcem
> Saturnus fugiens. *Juv. Sat.* XIII. 38.

Hence he is commonly repreſented in medals and ſtatues, holding an inſtrument of this kind in his hand *.

The red fiery appearance of the planet *Mars*, particularly, when he is in his moſt perfect

> Qualis ubi Oceani perfuſus Lucifer undâ,
> Quem Venus ante alios aſtrorum diligit ignes,
> Extulit os ſacrum Cælo, tenebraſque reſolvit.
> *Virg.* Æn. VIII. 589.

* See *Montfaucon*, Tom. I. Pl. 5. Fig. 1. and *Bryant*'s Mythology, vol. II. p. 259.

oppoſition

oppoſition to the ſun, and at the ſame time in his perigeon,* might lead the early aſtronomers to conſider that planet as the reſidence of the God of war. Hence we need not be ſolicitous to ſeek for authorities, from ancient hiſtory or poetry, to explain the ſymbol of this planet, which is obviouſly borrowed from two of the chief inſtruments of war, the ſpear and the ſhield, (ſee fig. 4. in the plate.) It is worthy of remark, that we are told by *Varro*, that the Romans worſhipped Mars under the ſimple repreſentation of a ſpear, before they had any ſtatues or images of their Gods †.

The rapid revolution and movements of the planet known by the name of *Mercury*, ‡ more particularly as he never moves, but a ſmall

* It is not impoſſible that *Lucan*, in the following paſſage, alluded to this ſplendid appearance of Mars, when theſe circumſtances occur in its revolution, where he deſcribes it as reigning alone in the Heavens, giving dreadful omens of the calamities impending over the Roman ſtate.

- - - - - - - - - - - - Tu, qui flagrante minacem
Scorpion incendis cauda, chelaſque peruris,
Quid tantum, Gradive, paras? nam mitis in alto
Jupiter occaſu premitur, Veneriſque ſalubre
Sidus hebet, motuque celer Cyllenius hæret,
Et Cælum *Mars* ſolus habet - - - - - - - - -
Imminet armorum rabies, ferrique poteſtas
Confundet jus omne. Luc. Pharſ. Lib. I. 658.

† See *Montfaucon*, Tom. I. B. III. p. 125.

‡ Cyllenius *celer*. Lucan ut ſupra.

diſtance

diſtance from the ſun, and returns quickly, as if engaged in the immediate execution of his commands, might lead the firſt aſtronomers to ſuppoſe, that this planet was ſacred to the Deity, whom their mythology had made the ſervant, officer or meſſenger of the Gods; and, therefore, as its ſymbol, they choſe the *Caduceus* the ſtaff of office, which that Deity was ſuppoſed to bear, (ſee fig. 5. in the plate.)

If this attempt, to explain the origin of theſe ſymbols, be admitted as plauſible, the credit of their invention, and their firſt application muſt be aſcribed to aſtronomy. But a greater difficulty now ariſes, to point out, by what principles the chemiſts were led to appropriate them to their art; an undertaking much more perplexed, and, which my attempts to illuſtrate, will require all the indulgence and favour of this learned Society. I give up entirely their pretenſions to the invention of theſe characters, and, therefore, ſhall not pay any attention here to the attempts, which *Boerhaave* and others have made to explain them; but ſhall proceed upon a quite different plan.

The peculiar ſplendour of the ſun and moon had without doubt been long noticed; and long before the introduction of chemical ſcience, the language of poetry (and in the earlieſt ages almoſt all language was poetical, that is, figurative) had diſcriminated that of the former by epithets, borrowed

borrowed from the analogous ſplendour and colour of gold; and that of the latter, by thoſe borrowed, from the purer white luſtre of the moon. A few inſtances, out of many, of their metaphorical mode of expreſſion, are inſerted in the margin*. The frequent uſe of theſe epithets might eaſily lead an enthuſiaſtic mind to conceive, that a real analogy and correſpondence ſubſiſted, between theſe planets and the metals. This opinion to a ſtrong and fertile imagination (improved too by the aſtrological notions, which might at the ſame time prevail, concerning the real or virtual emanations of the planets) might ſeem to receive confirmation, from innumerable circumſtances, and ultimately ſuggeſt the employment of the ſame ſymbolical characters for the metals, which had before been appropriated to the planets. Hence

* Aurati Solis radii. *Virg.* Æn. XII. 164.
Solis aurata corona. *Statii* Thab. III. 414.
Sol auricomus. *Val Flace* IV. 95.

Aureus axis erat, temo aureus, aurea ſummæ
Curvatura rotæ, ſays *Ovid* in his deſcription of the chariot of the ſun. *Metam.* Lib. II. 107.

Clara mi cante auro—of the palace of the ſun. Id. line 2.
Sol aureus. *Virg.* G. I. 232.—G. IV. 50.
Niveos Luna levarit equos. *Ov.* Faſt. IV. 374.
Nec candida curſum Luna negat. *Virg.* Æn. VII. 8.
Faveas; Dea candida, dixi.
*Ovid* Epiſt. Leander Heroni LXI.
Fulges radiis argentea puris. Id. LXXI.

gold

gold came to be typified, by the circle of the ſun, and ſilver by the creſcent of the moon. The number of the metals, at that time known, agreeing exactly with the number of planets, would lead to an extenſion of this analogy to the whole; and every metal would eaſily be found, or ſuppoſed to have a relation to one or other of the ſeven planets, and receive as its mark the aſtronomical character of that planet. Some circumſtances, which might give a foundation for theſe ſuppoſitions, ſhall now be enumerated. *Copper* was found, principally, or in the moſt conſiderable quantities, in the iſland of Cyprus, and the manufacture of braſs was not only invented there, but carried to a degree of perfection unknown in other countries; inſomuch that we are informed by Pliny,* that either the metal derived its name from the iſland, or the iſland from the metal. As this iſland was ſuppoſed to be under the immediate dominion of Venus,† an obvious connection was diſ-

* Nat. Hiſt. Lib. XXXIV. 2.

† Κυπρος δ'εισ ἀνυγας Παμφυλιης ἐνδοθι κολπε
Κλυζεῖ', επηρσιον αξυ Διωναιης 'Αφροδιτης.
Cyprus autem ortum verſus Pamphylium intra ſinum
Albuitur, amabilis Urbs Dioneæ Veneris.
*Well's Dionyſius*, 1240.

Ipſa Paphum ſublimis abit, ſedeſque reviſit
Læta ſuas: ubi Templum illi, centumque ſabæo
Thure calent aræ, ſertiſque recentibus halant.
*Virg.* Æn. I. 419.

covered

covered, which juſtified the application of the ſymbol of the planet to the metal.

The Uſe of *Iron*, in framing the inſtruments of war, preſents ſo ſtriking a relation, between this metal and the God Mars, that we need not wonder, that the ſymbol of that planet was applied to diſtinguiſh iron.

The mobility and unfixable nature of the metallic fluid *Quickſilver*, was naturally, by minds thus diſpoſed to form analogies, compared with the rapid movements of the planet Mercury, and accordingly, the ſymbol of the planet was appropriated to the metal.

On the other hand, the ſlow motion of Saturn, the coldneſs of his ſituation, ſo far removed from the Sun,* and his dull aſpect, which obtained him the epithets of *frigida*, *gelida*, *rigens* † preſented a ſufficient reſemblance to the obvious, as well as the medicinal qualities of *Lead*, to countenance the ſuppoſition of a relation between the metal and the planet, and to authorize the application of the ſymbol of Saturn to lead.

* Hence *Lucan*,

---------- Summo ſi frigida Cælo
Stella nocens nigros *Saturni* accenderit Ignes.
Pharſal. B. I. 651.

† Plinii Nat. Hiſt. L. II. C. 6.

The analogy being extended thus far, without any great violence, the remaining ſymbol of Jupiter was applied to *Tin*, for which, the bright ſplendour of the planet and of the metal, might ſeem to give a plauſible reaſon. *

This metal was not found in any of the countries of the ancient world, which were commonly known, and eaſy of acceſs. It was imported by the Phœnicians from ſome of thoſe regions, with which they traded in their voyages beyond the Pillars of Hercules; particularly, it was ſaid to be brought from ſome iſlands, which were called *Caſſiterides*. Whether the metal received the appellation of *Caſſiteron*, (or *Caſſiteros*, as Homer calls it) from theſe iſlands, or they were ſo called from the metal, is uncertain; nor is it leſs uncertain, what theſe iſlands were, and where they were ſituated. Some place them on the weſtern coaſts of Spain, Portugal, or Africa: others ſuppoſe them to have been, the Scilly iſlands near the Land's end, in Cornwall.† It is not,

* It may be remarked, that *Homer* gives to Tin the ſame epithet φαεινος, which he frequently uſes, to expreſs the bright ſplendour of the moon, and planets. *Iliad* Ψ 361.

† In *Wells*'s edition of *Dionyſius*' Geography, it is poſitively aſſerted, that the *Caſſiterides* were ſituated near the Land's end in Cornwall, and that they had their name from the Greek word Κασσίτερον, tin, which they produced in great plenty. (*Dionyſii* Geograph. par *Wells.*)

*Borlaſe*

not, therefore, impoſſible, that the Phœnician Navigators, who were always remarkably ſecret concerning the country from whence they obtained their tin,* might inſinuate, that this metal was diſcovered to them by the Deity, who preſided over the ſea, (not the Neptune of the Greeks and Romans, but the more ancient Oceanus, who was, in Egypt, Phœnicia, and even Greece, in its earlieſt periods, confounded with the Supreme Being.)†

May I therefore be allowed to conjecture, that there was a prevailing tradition, that Tin was diſcovered to the Phœnicians by Jupiter himſelf?

*Borlaſe* admits the truth of this poſition in general, but inſinuates, that, probably, the name was derived from a Phœnician word of ſimilar ſound and import.

*Borlaſe*, Antiquities of Cornwall, Ch. VII.

* See ſome remarkable inſtances of this diſpoſition in *Borlaſe*'s Antiquities, Ch. VII.

† Some of the ancient Greek writers expreſsly call Oceanus by the titles of the Supreme Being. We have in Homer the following expreſſions:

Ὠκεανὸ, ὅσπερ γενεσις πάντεσσι τετυκται

Oceani, qui quidem Parens omnibus eſt.

Hom. Iliad. XIV. 246.

Ὠκεανοντε Θεων γενεσιν. Id. V. 200.

Oceanumque Deorum Parentem.

And Plutarch, in his Iſis and Oſiris, ſays directly "Ὠκεανον Οσιριδα, that Oſiris and Oceanus were the ſame." See further in Bryant's Account of Noah. V. II. 269.

If it were possible to prove, that any traces of such an opinion as this subsisted at the time when the Alchemical doctrines began to be prevalent, we should not be at a loss to determine, why Tin was honoured with the symbol of Jupiter. But on this point, I have no other support than mere conjecture, which I submit, with the rest of the Dissertation, to the candour of the Society, hoping they will not mark with the severity of critical accuracy or censure, my endeavours to deserve the honour of becoming one of their members. Before I conclude, allow me to mention, that in the above dissertation, though I might frequently have drawn my illustrations from the Greek authors, I have principally confined myself to the Roman, and those the most common and familiar, as supposing these were most likely to be known, if any were known, to the Alchemical authors, who first transferred to the metals the ancient astronomical characters of the planets.

I am, dear Sir,

With great Respect,

Your sincere Friend

and obedient Servant,

M. WALL.

REMARKS

## REMARKS *on the* KNOWLEDGE *of the* ANCIENTS.

*By* WILLIAM FALCONER, M. D. F. R. S.

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THE ſuperiority of the Moderns over the Ancients, in moſt branches of Natural Philoſophy, is generally received as an acknowledged truth, and is, probably, well founded. Nevertheleſs, I am inclined to think, that the ignorance of the ancients has been over-rated, and, that ſeveral things were known to them, at leaſt as facts, and matters of obſervation, which are not apprehended to be ſo, by the generality of people. Much learning and induſtry has been beſtowed on this ſubject, by the Rev. Mr. Dutens, in his very ingenious Inquiry into the Origin of the Diſcoveries attributed to the Moderns, to which I beg leave to add a few remarks, that have occurred to me in the courſe of reading. And

I. I believe it is eſteemed to be an original diſcovery of Dr. Black, That water which had been boiled was more eaſily frozen, than water that had not undergone that operation.

But, That water which had been heated, was by that means rendered eaſier to be cooled, was well known to the ancients.

Ariſtotle obſerves, That water freezes the ſooner for having been before heated; and, that this fact was even known to ſome barbarous people upon the Euxine Sea, who made uſe of Ice as a kind of cement for their huts; and that the water frozen for this purpoſe, was firſt heated, in order* that it might concrete the ſooner." Pliny† alſo mentions it as a diſcovery of Nero, to boil the water that was intended to be frozen, as that haſtened its concretion.

Athenæus‡ alſo remarks, "that in the Iſle Cemolus they placed water in their Refrigeratories which had been heated by the rays of the ſun, and, that they reproved their ſervants, if the water they provided for freezing was not previouſly heated."

There is to this purpoſe, a curious paſſage in Hippocrates, in the ſixth book and fourth ſection of the Epidemics; which, though I am unable to clear up, I think has ſome reference to this ſubject. The words are as follows.

Υδωρ αφεψηθεν, το μεν ως δεχηται τον αερα, το δε μη εμπλεον ειναι, και επιθημα εχειν.

* Ariſtot. Meteorol. L. I. Cap. 12.

† Plinii Hiſt. Nat. L. XXXI. Cap. 3.

‡ Athenæi. Lib. III. p. 123. 124. Edit. Caſaubon.

This

This direction is relative to the preparation of the water, to be drank by the patient, which is ordered to be, ſuch as has been boiled; and part of the preparation was performed, with the water expoſed to the air, and part, with the veſſel cloſed up.*

The firſt, referred to the boiling or heating the water, and the latter, to the cooling of it; as I ſuppoſe, it was boiled, to throw out or expel the air, and then cloſed up, that it might not recover it again when cooling, which would have retarded its refrigeration, according to the modern theory. Galen, though he does not explain the meaning quite in the † ſame manner as I have done, imagines, that Hippocrates alludes to the boiling of water, that was afterwards to be drank cold, as, in the ſentence juſt preceding the former, cold things had been recommended. Galen accounts for the obſcurity of this paſſage, by informing us, that theſe works of Hippocrates were not written for publication, but as private notes to aſſiſt the memory.

* When water is boiled, care ſhould be taken that air ſhould be allowed admiſſion to the veſſel, that the veſſel be not quite full, and that it have a cover. Farr's Tranſl.

† Galen, however, ſeems to think, that the water was to be boiled in an open veſſel, and, when let down into the Refrigeratory, to be cloſed up, ſo as to exclude all air. Galen Comm. in Lib. VI. §. 4. Epidem. Hippocr.

Galen himſelf was perſonally well acquainted with this effect of boiling, in diſpoſing water to cool more rapidly, and to a greater degree. "When," ſays he, "we wiſh to render water as cool as poſſible, we firſt heat it, then ſurround with ſnow the veſſel containing it, or, if ſnow be wanting, we place it in the well or ſtream of a ſpring, and thus its temperature is more eaſily changed."

This he aſcribes to the rarefaction the water had before undergone, which is evidently not the true cauſe, as, upon cooling, it would be as much condenſed as before. Perhaps, the true cauſe may be, what is generally aſſigned, the diſcharge of the air. But how does this operate in promoting the refrigeration? Is it, that after the water has been freed of its air, any part of its latent heat has flown off with it, and thus rendered it more eaſily acceſſible to cold? Or, is the refrigeration more eaſy, on account of the diſcharge of air; as the air, being united with the water, and requiring to be diſengaged in freezing, might, by its attraction to the water, require more cold to diſengage it, than would have frozen the water, had it not had that attraction to overcome?

It muſt, however, be remarked, that Galen not only ſpeaks of water that has been previouſly heated, being more eaſy to be *frozen*, but alſo ſays, ſuch water is more eaſily cooled, even to any

any inferior degree: a fact worthy to be aſcertained by experiment.

II. I believe the fact, Of the production of cold by the evaporation of fluids, is eſteemed a modern diſcovery, as it juſtly may be: but it ſtill appears (though the modern diſcoverers were not acquainted with it) that it was familiarly known to the ancients, and not only to the Greeks and Romans, but the Egyptians alſo.

Athenæus mentions, "that Protagorides, in deſcribing the navigation of Antiochus upon the Nile, or Euphrates, relates the method uſed in that country, of cooling liquor, which was, by firſt heating it by expoſure to the ſun, and then ſtraining it, and ſetting it in earthen jars in the higheſt, and moſt open and expoſed part of the building, whilſt two boys were employed all the night, in keeping the outſides of the jars moiſt. After this, they preſerved the coolneſs of its temperature, by covering the jars with ſtraw. This, ſays he, cooled the water to ſo great a degree, that they felt no want of ice." *

Galen ſays, the method of cooling water, uſed at Alexandria, was as follows: "About ſun-ſet, they poured water which had been firſt heated, into jars, which they hung up in the higheſt parts of the buildings, with the windows open, oppoſite to that point from whence the wind blew. Before ſun-riſe, they

* Athen. p. 124.

placed

placed the jars upon the ground, and moiſtened the outſide, and covered them with cool and ſucculent leaves, as of lettuce, &c. in order that the water might retain the cool temperature it had thus acquired." *

The modern method of making ice in the Eaſt Indies, reſembles the above in many reſpects. Pits are dug in large open plains, places moſt expoſed to circulation of air, and of conſequence, to evaporation: theſe are ſtrewed with reeds, in order to admit the circulation of air on all ſides, and on theſe are placed ſhallow pans of earth filled with water, and the texture of theſe pans is ſo porous, as to admit the water to percolate through them, in ſuch a manner, as to keep the outſide always moiſt, and of conſequence, producing cold by evaporation. The water uſed for this purpoſe has alſo been previouſly boiled. It is needleſs to remark, how much this proceſs reſembles thoſe before quoted, and how probable it is, from the immutability of ancient manners, that it was a cuſtom derived from very remote antiquity.

III. Some other diſcoveries, ſuch as, "The ſolution of water in air, and that this ſolution is aſſiſted by heat and agitation," appear not to have been unknown to the ancients, though their notions hereupon were far from clear.

* Galen Comm. in Lib. VI. Epidem. Hippoc. Comm. IV.

The

"The moiſture, ſays Ariſtotle, that is about the earth, being converted into vapours by the rays of the ſun, aſcends. When it has ariſen, the heat, by whoſe aſſiſtance it had aſcended, leaves the vapour (or, as Dr. Black would ſay, becomes ſenſible) and then, the vapour again aſſumes a conſiſtence, and, from being in the form of air, becomes water. Meteorol. L. I. C. 9.

"The reaſon, ſays Ariſtotle, why dew and hoar froſt do not concrete in elevated ſituations, is, that in them the air is much agitated, which diſſolves* the conſiſtence of the water. Ibidem. Cap. 10.

Dr. Black's doctrine of Latent Heat, ſeems not to have been altogether unknown to the ancients.

"Snow, ſays Ariſtotle, cannot be formed, without the cold prevails, much heat ſtill remaining in it. For in a cloud, or vapour, there is much heat which remains of that fire, that has abſorbed the moiſture from the earth." Ariſtotle here mentions, that heat or fire was ſtill contained in the cloud or vapour, and ſo far is agreeable to Dr. Black's ſyſtem; but the latter diſcovered, that when the condenſation took place, the heat, before latent, then became ſenſible.

* Ος διαλυει την τοιαυτην συσασιν.

N. B. Συσασις means the conſiſtence, or ſolid form of any thing, in its primary ſignification, and is often applied to water. Vide Lex. Budæi. Vox Συσασις

IV. The

IV. The ancients perfectly knew the reason, why the air near the earth was more heated, than in higher situations. Aristotle explains this, from the reflection of the solar * rays from the surface of the ground; which cause is also assigned by Seneca. † This is, I believe, generally understood to be a discovery of Sir Isaac Newton.

V. Aristotle ‡ assigns a cause for the sudden concretion of Hail Stones, to which he very properly attributes their largeness of size, which I have never before met with, and yet is, perhaps, the true one. He observes, "that hail generally falls most plentifully in hot weather:" and it is to this previous heat, which must have affected the vapour, and the water contained in it, that he ascribes the sudden congelation of the hail, in the same manner, as water, previously heated, is found to freeze more easily and suddenly.

VI. The fact ‖ likewise, of the separation of air from

* —— εις τον ανω τοπον μαλλον οντα ψυχρον δια το ληγειν εχει τας απο της γης των ακτινων ανακλαζεις.

Meteor, Lib. I. C. 12.

† —— quod radii Solis a terra resiliunt et in se recurrunt, Horum duplicatio proxima quæque a terris calefacit. Quæ ideo plus habent teporis, quia solem bis sentiunt.

*Seneca* Nat. Quæst. L. IV. Sect. 8.

‡ Meteorolog. De Grandine.

‖ το μεν αυτε λαμπρον και κουφον και γλυκυ εκκρινεται και αφανιζεται, το δε θολωδεστατον και σταθμωδεστατον λειπεται.

Hipp. de Aere Aquis et locis. §. XX.

Δαι

from water, by freezing the latter, appears to have been not unknown to the ancients. Probably, this is what was meant by Hippocrates, when he ſays, "that the clear, light, and ſweet parts of the water, are diſſipated by freezing;" an opinion which Ariſtotle ſeems to have adopted, probably from this ſource.

Aulus Gellius* explains this paſſage of Ariſtotle, as if the air was preſſed, as it were, from water, by its concretion; and Macrobius † expreſſes the ſame, in terms more plain and diſtinct, and ſeems to ſay, that it was neceſſary for water to part with its air, in order to its congelation.

VII. It is often imagined, that the fact, Of water riſing to its level in pipes, was a modern diſ-

Δαι τι απο χιονος και κρυσταλλων υδατα φαυλα εστιν; οτι παντος υδατος πηγνυμενε το λεπτοτατον διαπνειται και κουφοτατον εξαλμιζει.
Ariſt. Meteor.

* Quoniam cum aqua frigore aeris duratur, et coit, neceſſe eſt fieri evaporationem, et quandam quaſi auram tenuiſſimam exprimi ex ea et emanare: id autem, inquit, in ea leviſſimum eſt quod evaporatur.
Aul. Gell. Noct. Attic. IX. 5.

† Omnis aqua, inquit, habet in ſe Aeris tenuiſſimi portionem, qua ſalutaris eſt: habetque terream fæcem, qua eſt corpulenta poſt terram. Cum ergo Aeris frigore et gelu coacta caleſcit, neceſſe eſt per evaporationem velut exprimi ex illa Auram tenuiſſimam, qua diſcedente conveniat in coagulum.
Macrob. Saturn. L. VII. C. 12.

covery;

covery; but it appears to be by no means ſo: and that the Aquæducts built at ſuch vaſt expence for the conveyance of water, were not conſtructed for want of knowing, that pipes would anſwer a ſimilar purpoſe, but from the perſuaſion, that the water, in pipes of lead eſpecially, was leſs wholeſome, than water conveyed in an open channel. This appears very clear, from the following paſſage in Palladius.* "Si quis mons interjectus occurrerit, aut per latera ejus aquam ducemus obliquam, aut ad aquæ caput ſpeluncas librabimus, per quarum ſtructuram perveniat. Sed ſi ſe vallis interſerat, erectas pilas, vel arcus uſque ad aquæ juſta veſtigia conſtruemus, aut plumbeis fiſtulis clauſam dejici patiemur, et explicata valle conſurgere. Ultima ratio eſt, plumbeis fiſtulis ducere, quæ aquas noxias reddunt." Vitrivius† expreſſes the ſame, though in terms rather more obſcure; and Pliny‡ gives particular directions on the ſubject.

* Pallad. Menſ. Auguſt.

† Vitruv. L. VIII. C. 7.

‡ L. XXXI. C. 6.

## *An* Enquiry *concerning the* Influence *of the* Scenery *of a* Country *on the* Manners *of its* Inhabitants. *By* William Falconer, M. D. F. R. S. *Read October* 23, 1782.

IT is an ancient maxim in Philoſophy, attributed to Ariſtotle, and generally acquieſced in, That all mental ideas were primarily ſuggeſted, by ſenſible objects, through the medium of the ſenſes. Whether this opinion be univerſally true, is not here meant to be diſcuſſed: but, that external objects influence our actions and conduct, and even direct our ſpeculative ſentiments, is too evident to bear diſpute.

Animated beings, and, far above the reſt, the human ſpecies, are the moſt powerful in producing theſe effects. We are naturally led to adopt the paſſions, and, to a certain degree, to imitate the character of thoſe, to whoſe company and converſation we are daily habituated; and this diſpoſition is ſo potent, that even error and prejudice are often introduced, and almoſt voluntarily entertained, by thoſe, whoſe character and underſtanding, in other inſtances, ſhould ſeem to afford the moſt complete ſecurity againſt ſuch examples of human frailty.

A leſs

A leſs potent, but a ſomewhat ſimilar influence, is exerted by inanimate objects. Scenes of horror, even though compoſed of lifeleſs materials, impart gloomy and terrible ideas to the mind; and thoſe of pleaſure tend, on the contrary, to exhilarate and refreſh it. Hence we may infer, that the aſpect or face of a country might contribute, in ſome meaſure, towards the formation of the manners, and character of the people.

The immediate and direct effect of the ſight of objects, of either of the kinds above-mentioned, would be, I apprehend, but weak; but we ſhould conſider, that they muſt, from their nature, be almoſt conſtantly operating; and by their repeated action may make amends for the ſlightneſs of the impreſſions, diſtinctly conſidered.

As it is the natural property of beautiful objects to communicate pleaſurable ideas to the mind, and to elevate the ſpirits, we may from thence infer, that the view of a fertile, pleaſant, and cultivated country, would inſpire ſentiments of delight and ſatisfaction into thoſe accuſtomed to ſurvey it. A cultivated garden was the ſcene of delight, ſelected by that celebrated patron of ſenſual pleaſure Epicurus; and the exhilarating effects produced upon the mind by the * ſurvey of

* ---------- and now is come
Into the bliſsful field, thro' groves of Myrrh,
And flowering odours, Caſſia, Nard, and Balm,
A wilderneſs of ſweets, for Nature here
Wantons

of a beautiful ſcenery of country, are noticed by ſeveral of the poets, and particularly by Milton.

Is it not hence probable, that ſuch a view would tend to inſpire permanent chearfulneſs of temper, into thoſe daily accuſtomed to behold it, both, as it preſents great variety of ſubjects of attention and admiration, and as it fills the mind with repreſentations of pleaſing objects?

Wantons as in her prime, and plays at will
Her virgin fancies, pouring forth more ſweet,
Wild above rule, or art, enormous bliſs,
Paradiſe Loſt, Book V.

- - - - - - - - - - - - about me round I ſaw,
Hill, dale, and ſhady woods, and ſunny plains,
And liquid lapſe of murmuring ſtreams: by theſe,
Creatures that liv'd, and mov'd, and walk'd, and flew:
Birds on the branches warbling: all things ſmil'd
With fragrance, and with joy my heart o'erflow'd.
Paradiſe Loſt, Book VIII.

Straight mine eye hath caught new pleaſures,
While the landſcape round it meaſures,
Ruſſet lawns, and fallows gray,
Where the nibbling flocks do ſtray:
Mountains, on whoſe barren breaſt
The labouring clouds do often reſt:
Meadows, trim with daiſies pied:
Shallow brooks, and rivers wide:
Towers, and battlements it ſees,
Boſom'd high in tufted trees.
*Milton*'s Allegro.

Why ſit we ſad, when Phoſphor ſhines ſo clear,
And laviſh nature paints the purple year?
*Pope*'s Firſt Paſtoral.

Cicero, in his Letters to Atticus,* ſpeaks of the pleaſures of a garden, as the beſt remedy for grief and concern of mind; and in one of his philoſophical dialogues, † he recommends attention to the natural beauties of a fine and cultivated country, as the proper ſtudy of the calm and ſerene period of old age.

* Deinde etiam ad καταβιοσιν mæſtitiamque medendam nihil mihi reperiri poteſt aerius.

*Cic.* Epiſt. ad Attic. L. XIII.

† Quid de pratorum viriditate, aut arborum ordinibus, aut vinearum olivetorumque ſpecie, dicam? Brevi precidam. Agro bene culto nil poteſt eſſe, nec uſu uberius, nec ſpecie ornatius, ad quem fruendum non modo non retardat, verum etiam invitat atque allectat Senectus.

*Cicero.* de Senect. §. LIII.

Vobis mehercule Martis viris cavenda et fugienda imprimis amoenitas eſt Aſiæ, tantum hæ peregrinæ voluptates ad extinguendum vigorem animorum poſſunt.

*Livii*, L. XXVII.

Loca amoena voluptaria facile in otio feroces militum animos molliverant.

*Salluſt.* Bell. Catilin.

Itaque ut frugum ſemina mutato ſole degenerant, ſic illa genuina feritas eorum Aſiatica amoenitate mollita eſt.

Flor. L. II. C. 11.

Effeminat animos amænitas nimia, nec dubiè aliquid ad corrumpendum vigorem poteſt regio. Fortior miles ex confragoſo venit.

*Senecæ.* Epiſt. L. I. Ep. 51.

N. B. The word amoenus is applicable to what is pleaſant or agreeable to the eye, in place or ſituation, and, of courſe, refers to the ſcenery or face of the country.

It

It is, however, probable, that the pleaſures inſpired by ſuch a ſcenery as is above alluded to, which is rather of a luxurious tendency, may coincide with the effects of the climate, in which ſuch proſpects are moſtly produced, in contributing to weaken and effeminate the mind and diſpoſition. However whimſical this notion may appear, it has been adopted by writers, in the higheſt eſteem for underſtanding and diſcernment. Perhaps, for the ſame reaſon, a beautiful and ornamented country has been thought to be favourable to the ſofter paſſions. "Love," ſays Agatho in the banquet of Plato, "reſides not in a body or ſoul, or any other place, where flowers never ſpring; or, if they do ſpring, where they are fallen, and the ſpot quite deflowered. But, wherever a ſpot is to be found flowry and fragrant, he there ſeats himſelf, and ſettles his abode." The beauty of the country, muſt, no doubt, contribute to the improvement of the taſte of the inhabitants, both in arts and ſcience.

Taſte, which is in other words, the faculty of diſcerning and reliſhing beauty, is acquired by the compariſon of beautiful objects with one another, and, upon that account, is likely to be found in greater perfection, where thoſe objects abound the moſt, and where, of courſe, ſuch compariſons would be the moſt obvious and eaſy. Hence ſprings, in a good meaſure, I apprehend, the elegant and varied fancy of the eaſtern peo-

ple, exemplified in ſome of their works of art, particularly the patterns of their manufactures. The diverſified beauty of the vegetables, that cover the ground in thoſe countries, could ſcarcely fail to ſuggeſt ideas, far ſuperior to what could be imagined by thoſe, who never had any opportunity of ſeeing ſuch delicate productions.

The moſt admired paſſages in the eaſtern writings, eſpecially the poetical, owe much of their power and effect, to the painting of the natural beauties of the country and climate. A late writer,* of no inconſiderable taſte, as well as talent for obſervation, has remarked of the Spaniards, that the ſimilies uſed by them, are univerſally taken from the beautiful objects of nature continually before their eyes. "The fragrance of the roſe, the odour of the orange, the perfume of the myrtle, the murmuring of the cave inviting to ſlumber, the height of the mountains, the ſteepneſs of the rocks, the ſplendour of the riſing ſun, the coolneſs of the evening breeze, and the brilliancy of the ſtars by night, afford them endleſs allegories." Even Homer himſelf, that great maſter of our paſſions, is not a little indebted to his familiar acquaintance with the ſcenery of a beautiful country, for the raviſhing

* Carter's Travels from Gibraltar to Malaga.

effects

effects of many of his deſcriptions and compariſons.*

Milton appears to have been ſo ſenſible of this effect of Homer's pictureſque repreſentations, that he has ventured, perhaps improperly, to

* Glad earth perceives, and from her boſom pours
Unbidden herbs, and voluntary flowers:
Thick new-born violets a ſoft carpet ſpread,
And cluſtring lotos ſwell'd the riſing bed;
And ſudden hyacinths the turf beſtrow,
And flamy crocus made the mountain glow:
Celeſtial dews deſcending o'er the ground,
Perfume the mount, and breathe ambroſia round.
*Pope's Homer* Iliad. B. XIV. L. 395.

Next this, the eye the art of Vulcan leads
Deep thro' fair foreſts and a length of meads,
And ſtalls, and folds, and ſcatter'd cots between,
And fleecy flocks, that whiten all the ſcene.
*Homer's* Iliad. Deſcr. of Achilles's Shield.

Elyſium ſhall be thine, the bliſsful plains
Of utmoſt earth, where Radamanthus reigns:
Joys ever young unmix'd, with pain or fear,
Fill the wide circle of the eternal year:
Stern winter ſmiles on that auſpicious clime;
The fields are florid with unfading prime;
From the bleak pole no winds inclement blow,
Mould round the hail, or ſhake the fleecy ſnow;
But from the breezy deep, the bleſt inhale
The fragrant murmurs of the weſtern gale,
*Homer's* Odyſſ. B. IV.

adorn a ſcene laid in Britain, with productions peculiar to Aſiatic climes.*

A beautiful ſcenery of a country contributes, I apprehend, to influence the ſentiments of the people in ſome points reſpecting Religion. Thus, it is more than probable, that many of the ideas in the Roman and Greek mythologies, concerning a future ſtate of happineſs, were derived from this ſource. Homer's deſcription of the Elyſian fields, † and of the dwelling of the Gods, ‡ is evidently borrowed from what he

* May thy lofty head be crown'd
With many a tower and terras round,
And here and there thy banks upon
With groves of myrrh and cinnamon.
*Milton*'s Comus.

† See laſt page, Note *

‡ Without the grot, a various ſylvan ſcene
Appear'd around, and groves of living green,
Poplars and alders ever quivering play'd,
And nodding cypreſs form'd a fragant ſhade,
On whoſe high branches waving with the ſtorm,
The birds of broadeſt wing their manſion form;
The chough, the ſea-mew, the loquacious crow,
And ſcream aloft, and ſkim the deeps below:
Depending vines the ſhelving cavern ſcreen,
With purple cluſters bluſhing thro' the green;
Four limpid fountains from the clefts diſtil,
And every fountain pours a different rill,
In mazy windings wandering down the hill,
Where blooming meads with vivid greens were crown'd,
And glowing violets threw odours round;
A ſcene, where, if a God ſhou'd caſt his ſight,
A God might gaze and wander with delight.

had

had ſeen in a fine country: and Virgil,* and Tibullus, † ſeem to have taken their deſcriptions of the ſituation of the happy in a future life, from thoſe natural beauties, with which they were familiar.

The ſame circumſtances appear to have influenced the general opinions, concerning a place of future puniſhment. As the reſidence of the bleſt was ſuppoſed to be in a country exquiſitely adorned with natural beauties, ſo that of the

* Devenere locos lætos, et amoena vireta,
Fortunatorum nemorum, ſedeſque beatas:
Largior hic campos Æther, et lumine veſtit
Purpureo, Solemque ſuum ſua ſidera norunt.
*Virg.* Æneid. Lib. VI.

† Sed me, quod facilis tenero ſum ſemper amori,
Ipſa Venus campos ducet in Elyſios.
Hic cheræ cantuſque vigent, paſſimque vagantes
Dulce ſonant tenui gutture carmen aves.
Fert caſiam non culta ſeges, totoſque per agros
Floret odoratis terra benigna roſis.
*Tibull.* Eleg. Lib. I. El. 4.

Propertius ſpeaks of Elyſian roſes,
Mulcet ubi Elyſias aura beata roſas.
Prop. Lib. IV. El. 7. L. 60.

Milton uſes nearly the ſame expreſſion;
On a bed
Of heapt Elyſian flowers.
*Milton* Allegro. L. 146, 147.

Rolls o'er Elyſian flowers her amber ſtream.
Par. Loſt. III. 359.

miſerable was placed in a region,* dark and uncultivated, foul and horrible, in which circumſtances, the miſery of thoſe condemned to inhabit it was thought, in a good meaſure, to conſiſt. Such are the effects we ſuppoſe producible by the beautiful face of a country.

Let us now ſee what would be the effects of one of a different appearance.

Hippocrates obſerves,† that the inhabitants of rough, mountainous, and uncultivated coun-

* Low in the dark Tartarean gulf ſhall groan.
Iliad. VIII. L. 16.

No ſun e'er gilds the gloomy horrors there,
No chearful gales refreſh the lazy air.
Iliad. VIII. 601 et.

At ſcelerata ſedes jacet in nocte profundâ
Abdita, quam circum flumina nigra ſonant.
*Tibull.* I. El. 4.

- - - - - - - - - - - tum Tartarus ipſe
Bis patet in præceps tantum, tenditque ſub umbras,
Quantus ad æthereum cœli ſuſpectus Olympum.
*Virg.* Æn. Lib. VI.

- - - - diverſo itinere malos a bonis loca tetra, inculta, fæda atque formidoloſa habere.
*Salluſt.* Bell. Catilinar.

Eſſe inferos Stoicus Zenon docuit et ſedes prorſum ab impiis eſſe diſcretas et illos quidem quietas et delectabiles incolere regiones, hos vero luere pœnas in tenebroſis locis, atque in cœni voraginibus horrendis.
*Lactantii.* Lib. VIII. C. 7.

† De Aerib. aquis et locis. Cap. LV.

tries,

tries, are rude and ferocious in their diſpoſition and manners. The people of Cynetha in Arcadia, who lived in a ſituation particularly* gloomy and diſagreeable, were ſo remarkable for their unſociable qualities, that they were expelled from the Grecian cities. The Cimmerians, who inhabited a country dark and melancholy, ſubſiſted upon robbery and plunder: and the country of the Cyclops, according to Homer's deſcription, was ſomewhat of a ſimilar appearance. The ſame diſpoſition, of the people inhabiting the ſame region, is mentioned by Fazellus, a writer concerning Sicily, about two hundred years ago, and confirmed, by the later teſtimony of Mr. Brydone. The Indians alſo, diſcovered a few years ſince by Mr. Byron, in the Southern Hemiſphere, were brutal and ſavage to an enormous exceſs.

May we not here ſuppoſe, with an elegant writer, that a ſtormy ſea, together with a frozen, barren and inhoſpitable ſhore, might work upon the imagination of theſe Indians, ſo as, by baniſhing all pleaſing and benign ideas, to fill them with habitual gloom, and with a propenſity † to cruelty? And might not the tremendous ſcenes of Etna have had a like effect upon the

* Athenæi. Lib. XIV. Polybii. Lib. IV. C. 3.

† Harris's Philolog. Enquiries, p. 518.

Cyclops,

Cyclops, who lived among ſmoke, thunderings, eruptions of fire, and earthquakes? *

If then, theſe limited regions ſo influenced their natives, may not a ſimilar effect be preſumed from the vaſt regions of the north; may not its cold, barren, and uncomfortable climate, have made its numerous tribes equally rude and ſavage? Ovid, the Roman poet, who, unfortunately for himſelf, had but too many opportunities for obſervations of this kind, ſeems to have been of this opinion, from his ſo frequently connecting his account of the country with the manners of the inhabitants. Is it not probable, that the dreary aſpect of the country, might be one cauſe of the devaſtations committed by theſe people, in their invaſions of the Roman

* Frigida me cohibent Euxini littora Ponti:
Dictus ab antiquis Axenus ille fuit.
Nam neque jactantur moderatis æquora ventis,
Nec placidos portus hoſpita navis adit.
Sunt circa gentes, quæ prædam ſanguine quærant,
Nec minus inſidâ terra timetur aqua.
Illi, quos audis, hominum gaudere cruore,
Pæne ſub ejuſdem ſideris axe jacent
*Ovid.* Triſt. L. IV. El. 4.

Sive locum ſpecto, locus eſt inamabilis, et quo
Eſſe nihil toto triſtius orbe poteſt.
Sive homines; vix ſunt homines, hoc nomine digni:
Quamque lupi ſævæ plus feritatis habent.
*Ovid.* Triſt. L. V. Eleg. 7.

empire?

empire?* A deſolate and uncultivated ſcene, which probably originally inſpired the ferocious diſpoſition of theſe people, was more congenial to their ideas and inclinations, than elegant buildings, and cultivated grounds, which, whilſt they betrayed the unwarlike ſpirit of their poſſeſſors, evidenced their ſuperiority in underſtanding and induſtry.

Miners, for the ſame reaſons, are generally obſerved to be a hardy, ferocious, and cruel ſet of men. The ſcenes of horror, miſery, and gloom, with which they are converſant, obliterate the finer ſenſations, and ſteel the heart againſt the ſentiments of tenderneſs and compaſſion. The

* Ovid mentions in his time, that the Getæ deſtroyed all the buildings, and laid the country waſte, wherever they went.

Hoſtis equo pollens, longéque volante ſagittâ
Vicinam late depopulatur humum.
Quæ nequeunt ſecum ferre aut abducere, perdunt,
Et cremat inſontes hoſtica flamma caſas.

*Ovid* Triſt. L. III. Eleg. 10.

Quicquid invenire poterat momento temporis parvi, vaſtabant, (Saraceni) milvorum rapacium ſimiles.

Amm Marcell. L. XIX. C. 4.

The Franks deſtroyed forty cities upon the Rhine.

Zoſim L. III. C. 1.

Alaric deſtroyed all the cities in Macedonia, Thrace and Greece, except Athens, and Thebes. Attila preferred his houſe of wood on the Tibiſcus, to all the ſplendid palaces he might have enjoyed. Zoſim. L. V. C. 5.

emotions

emotions of the mind, in theſe inſtances, correſpond with the wildneſs and ferocity of the ſurrounding chaos of objects, and require in order to humanize them, a certain degree of adjuſtment, and even embelliſhment, of external appearances. We might reaſonably conclude from hence, that a people ſo ſituated, would have their intellectual faculties conſiderably contracted, or depreſſed. The paucity of objects, and thoſe of a diſguſting, or terrible nature, would afford few motives for inquiry, and, of courſe, a narrow field for mental exertion.

The ancient Germans,* to whom letters were unknown, and who ſeem to have poſſeſſed very little thirſt after knowledge, dwelt in a region, dark with foreſts, and foul with marſhes; and the deſolate and uncultivated face of the country contributes, I doubt not, to encourage the ignorance of the American Indians. We might, with ſtill greater probability imagine, that ſuch a people would be particularly defective in all matters that regard taſte and ſentiment. This, however, is not altogether the caſe. Their ideas are indeed melancholy, and their views of nature dark and gloomy; but, nevertheleſs, often par-

* Terra etſi aliquanto ſpecie differt, eſt in univerſum, aut ſylvis horrida aut paludibus fæda.

Taciti Germania.

Multis montibus aſpera, et mana ex parte ſilvis et paludibus invia. Pompon. Mela.

take

take of a dreary magnificence, and ſullen grandeur, that produce a deep and laſting impreſſion upon the mind. Theſe ſentiments are congenial with the appearance of the country The ſtupendous ſcenery of rocks, clouds, precipices, torrents, and deſerts, continually exhibited to their ſenſes, cannot fail to ſuggeſt a train of thoughts and expreſſions correſponding therewith; and the accidents, to which a life of hunting, in a country that gives occaſions to ſo many dangers, is expoſed, contribute ſtill farther to increaſe the gloom, and throw a darker ſhade upon the imagination. Hence, ſorrow and terror are the paſſions they are moſt naturally led to excite. Their muſic, as well as their poetry, is plaintive, and, I believe, moſtly applied to the recital of melancholy tales, or unfortunate events. Even their ſuperſtitions are of a melancholy caſt.

The noted faculty of prying into futurity, by means of a previous ſight of events that were to take place, ſo noted in the Alpine ſcenes, both of Scotland and Swiſſerland, is held to be of a ſad and uncomfortable nature, unlike the Seers of old, who were thought to be particularly favoured by ſuch communications. This faculty has been regarded by thoſe, who believed they poſſeſſed it, as a misfortune, on account of the many dreadful images it obtruded upon the fancy. This kind of preſcience ſeems to have been principally, though not altogether, concerned

cerned in ſcenes of horror. Deaths, ſhipwrecks, ſtorms, and famine, were much more frequently predicted, than the chearful and exhilerating circumſtances of life; which forms no inconſiderable preſumption, that the ideas that occupied their minds, were principally of a gloomy and melancholy aſpect.

The notions of people, concerning a future ſtate, appear to be much influenced by the ſcenery of ſuch a country. Some nations have been ſo ſenſible of the diſadvantages and inconveniencies attending it, that they have formed their ſyſtem of future happineſs, apart from any connection with the appearance of the country. Thus the Scythians, and the northern nations of Europe, held their Elyſium to conſiſt, in the joys of wine, and of company collected in a ſpacious building. The American Indians, for ſimilar reaſons, have ſelected ſuch circumſtances only, as ſerved moſt to temper the gloomy and ſevere appearance of nature. Thus, they expect to be tranſlated to a country, where the ſky is always clear and unclouded, and a perpetual ſpring prevails. On the contrary, when they mean to deſcribe a place of future torment, they figure it as poſſeſſing all the dreary appendages belonging to their own country, but in a greater degree. Thus the *Iſurin*, or hell of the northern nations, was ſuppoſed to be a place dark, gloomy, cold, and deſtitute of every convenience of life; the former

former of which circumſtances, as well as the latter, were imagined to conſtitute the miſery inflicted by it.

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## *A* Tribute *to the* Memory *of* Charles de Polier, *Eſq.* *By* Thomas Percival, M. D. *Read November* 13, 1782.*

THE contemplation of moral and intellectual excellence affords the moſt pleaſing and inſtructive exerciſe, to a well conſtituted mind. By exalting our ideas of the human character,

October 30th, 1782.

* At a meeting of the *Literary and Philoſophical Society* of *Mancheſter*, the following reſolution paſſed unanimouſly.

"The Members of the *Literary and Philoſophical Society* lamenting, with heartfelt concern, the death of their late much honoured brother, *Charles de Polier*, Eſq; unanimouſly reſolve, that *Dr. Percival* be requeſted to draw up a grateful and reſpectful Tribute to his Memory; to be inſerted in the journals of the Society, with a view to record his diſtinguiſhed merit, and to prolong the influence of his bright example."

November 13th, 1782.

At a meeting of the *Literary and Philoſophical Society* it was reſolved unanimouſly, That the Thanks of the Society be returned to *Dr Percival*, for his Tribute to the Memory of *Charles de Polier*, Eſq; and that he be deſired to print the ſame."

it

it expands and heightens the principle of benevolence; and at the same time is favourable to piety, by raising our views to the supreme Author of all that is fair and good in man. The wise and the virtuous have ever dwelt, with delight, on the meritorious talents and dispositions of their fellow-creatures: And an amiable philosopher drew, from this source, such sweet consolations, under the toils and distresses of life, that he warmly recommends the practice to our imitation. "*When you would recreate your-*"*self*," says M. Antoninus, "*reflect on the lauda-*"*ble qualities of your acquaintance: On the magna-*"*nimity of one, the modesty of another, or the libera-*"*lity of a third.*" * Generous meditation! which every one, present, may indulge; and, by indulging, assimilate, to his own nature, the various perfections of others; transfusing, as it were, into his breast, the virtues which he contemplates.

But can we engage ourselves in such an exercise, without the most lively recollection of our late honoured and beloved colleague? His image presents itself before us; and we instantly recognise, the agreeableness of his form, the animation of his countenance, the vigour of his understanding, and the goodness of his heart. How graceful was his address; how sprightly, entertaining, and intelligent his conversation!

* M. Antonin. Lib. VI.

What

What rich ſtores of knowledge did he diſplay; what facility in the uſe, what judgment in the application of them! Few have been the ſubjects of diſcuſſion in this Society, which his obſervations have not enlightened: and what he could not himſelf elucidate, he has enabled others to do, by the pertinency of his queries, and the ſagacity of his conjectures. So quick was his penetration; ſo enlarged his comprehenſion; ſo exact the arrangement of his intellectual treaſures! Learning, with ſome, is the parent of mental obſcurity; and the multiplicity of ideas, which have been acquired by ſevere ſtudy, ſerves only to produce perplexity and confuſion. But Mr. de Polier's thoughts were always ready at command. And he engaged with perſpicuity, on every topic of diſcourſe; becauſe he ſaw, at one view, all its relations and analogies to thoſe branches of knowledge, with which he was already acquainted. With ſuch felicity of genius, he was continually making large acceſſions to his ſtock of ſcience, without laborious reſearches, or ſecluſion from the ſocial enjoyments of life.

Of his abilities as a writer, he furniſhed us with a ſtriking proof, in the Diſſertation he delivered, laſt winter; which is equally diſtinguiſhed by the juſtneſs of its ſentiments, and the purity of its diction; and fully diſplays his per-

fect attainment, both of the idiom and embelliſhments of the Engliſh language.

But Mr. de Polier had merits, more eſtimable than thoſe, which he derived from the vivacity of his fancy, the elegance of his taſte, or the powers of his underſtanding. And his friends will cordially unite with me in teſtifying, that, if honoured for his *intellectual*, he was beloved for his *moral* endowments. His heart was open to every generous ſympathy; and the ſenſibility of his nature ſo enlivened all his perceptions, that the ordinary duties of ſocial intercourſe were performed, by him, with a warmth, almoſt equal to that of friendſhip. Nor was this the artificial deportment of unmeaning courteſy; but the generous effuſion of a heart, which felt for all mankind. In ſuch *philanthropy*, politeneſs has its true foundation: and of this joint grace of nature and education, "which aids and ſtrengthens Virtue, where it meets her, and imitates her actions, where ſhe is not," our lamented brother was a bright example. So engaging were his manners, and at the ſame time ſo ſincere his diſpoſition, that we may apply to him, with *honour*, what Cicero meant as a *reproach*; that he was qualified, *cum triſtibus ſevére, cum remiſſis jucunde, cum ſenibus graviter, cum juventute comiter vivere.* Theſe powers of pleaſing flowed from no ſervile compliances, nor ever

ever led him into criminal indulgences. As a companion, he was convivial without intemperance, and gay without levity or licentiouſneſs. His converſation was ſprightly and unreſerved; but, in the moſt unguarded hours of mirth, exempt from all indecency and profaneneſs. And the ſallies of his wit and pleaſantry were ſo ſeaſoned with good humour, that they gave delight, unmixed with pain, even to thoſe who were the objects of them. If the coarſer pleaſures of the bottle be baniſhed from our tables; or if rational converſation, and delicacy of behaviour, with the ſweet ſociety of the ſofter ſex, be now ſubſtituted in their room, this happy revolution has been rendered more complete by the influence of Mr. de Polier.

But though URBANITY, according to the moſt liberal interpretation of that term, was the *characteriſtic* of our excellent colleague, he poſſeſſed other endowments, of more intrinſic value. And I could enlarge, with pleaſure, on his nice ſenſe of rectitude, his inviolable integrity, and ſacred regard to truth. Theſe moral virtues were, in him, founded on no fictitious principle of *honour*, but reſulted from the conſtitution of his mind; and were ſtrengthened by habit, regulated by reaſon, and ſanctioned by religion. For, notwithſtanding the veil which he choſe to caſt over his *piety*, it was manifeſt to his intimate friends; and may be recollected by others,

who have marked the ſerioufneſs, with which he diſcourſed, on every ſubject relative to the being and attributes of GOD. Defective indeed muſt be the character of that man, who can diſcern and acknowledge, without venerating, the divine perfections; and partake of the bounties of nature, yet feel no emotions of gratitude towards its benevolent Author. "*A* "*little philoſophy*," ſays lord Verulam, "*may incline* "*the mind to atheiſm; but depth in philoſophy will* "*bring it about again to religion.*"*

I have thus attempted to draw a rude ſketch of the features, of our late honoured friend. A fuller delineation might furniſh a more pleaſing picture to ſtrangers; but, to the Members of this Society, a few outlines will ſuffice to revive the image of the beloved original. This image, I truſt, will be long and forcibly impreſſed on our minds; and that every one, now preſent, may adopt the language of Tacitus, on a ſimilar occaſion. "*Quicquid ex Agricola amavimus, quic-* "*quid mirati ſumus, manet, manſurumque eſt in animis*

* The noble author ſubjoins a juſt reaſon, for this obſervation. "For while the mind of man," ſays he, "looketh upon *ſecond cauſes* ſcattered, it may ſometimes "reſt in them, and go no farther: but when it beholdeth "the chain of them linked together, it muſt needs fly to "Providence and Deity."

BACON'S Eſſay on Atheiſm.

"*hominum.*"

" *hominum.*" " Whatever in Agricola was the " object of our love and of our admiration, " remains, and will remain, in the hearts of " all who knew him."

Having taken a ſhort view of the character of Mr. de Polier, curioſity and attachment concur in prompting us, to extend the retroſpect; and we become ſolicitous to know ſomething of his connections and education; and to trace the leading events of a life, in the concluſion of which we have been ſo deeply intereſted. But our friend was no egotiſt; and the zeal with which he entered into the concerns of others, precluded the detail of his own. I muſt content, myſelf, therefore, with preſenting to the Society, the following brief memoirs.

Charles de Polier Bottens was the ſon of the Reverend —— de Polier Bottens, Dean of the Cathedral Church of Lauſanne, Preſident of the Synod of the Pais de Vaud, Member of the Society of Arts and Sciences at Manheim, and Citizen of Geneva. He was born at Lauſanne, in the year 1753; and received the firſt part of his education, in the public ſchools of that city. As ſoon as he had acquired a ſufficient knowledge of the claſſics, he was ſent to an academy near Caſſel, in Germany; from whence, after a reſidence of two years, he was removed to the univerſity of Gottingen. In this celebrated ſeat of learning, he paſſed three years;

and being then inclined to a military life, he obtained a lieutenant's commiſſion in the Swiſs regiment of D'Erlact, in the French ſervice. But he ſoon reſigned his commiſſion, and returned to Lauſanne; where he had a command given him, in one of the Provincial regiments of dragoons. In this ſituation, his connection commenced with the Earl of Tyrone; who offered him the tuition of his eldeſt ſon, Lord le Poer, on terms equally honourable and advantageous. But before the engagement was completed, propoſals were made to him by the duke of Saxe Gotha, to become governor to the hereditary prince, with an annuity, for life, of twelve hundred rixdollars; an apartment at court; and the poſt of chamberlain, or rank of colonel. Theſe propoſals, however, he declined in favour of lord Tyrone. And he executed the important truſt, aſſigned to him, with ſuch judgment, tenderneſs, and fidelity, as induced that reſpectable nobleman to commit three of his children to his ſole direction. Theſe amiable youths he brought to England, in the ſummer of 1779; and ſettled them at the ſchool of a clergyman in Mancheſter, who is eminently diſtinguiſhed by his virtues as a man, and abilities as a teacher.

At this period, our firſt acquaintance with Mr. de Polier was formed. By the laws of hoſpitality, he was entitled to our attention, as a ſtranger:

ſtranger: but his perſonal accompliſhments, and the charms of his converſation, ſoon ſuperſeded the ordinary claims of cuſtom, and converted formal civility into eſteem and friendſhip. He became our companion in pleaſure; our aſſiſtant in ſtudy; our counſellor in difficulty; and our ſolace in diſtreſs. Amuſement acquired a dignity and zeſt, by his participation; and he ſoftened the auſterity of philoſophy, whenever he joined in the purſuit. The inſtitution, which now celebrates his memory, owes to him much of its popularity and ſucceſs; and, ſo long as it ſubſiſts, his name will be revered, as one of its founders, and moſt ſhining ornaments.

About the middle of laſt winter he was attacked by a complaint, which at firſt gave no diſturbance to the vital functions. But being aggravated by the fatigues of a long journey to Holyhead, and of a voyage from thence to Dublin, at a time when he laboured under the *Influenza*, his malady rapidly increaſed after his arrival in Ireland; and put a final period to his valuable life on the 18th of October 1782.* The vigour of his faculties, and the warmth of his affections, continued even to the hour of his diſſolution. And the amiableneſs of his behaviour, in the cloſing ſcene of trial and ſuffering

* At CURRAGHMORE, near WATERFORD, the ſeat of the Earl of Tyrone.

through which he paſſed, gave ſuch completion to his character, that we may apply to him, what the Poet has ſaid of Mr. Addiſon;

> - - - - He taught us how to live; and, oh! too high
> The price of knowledge, taught us how to die, *

On this affecting event, I cannot expreſs your feelings and my own, in terms ſo forcible as thoſe of the animated hiſtorian, whom I have before quoted. *Si quis piorum manibus locus; ſi, ut ſapientibus placet, non cum corpore exſtinguuntur magnæ animæ; placide quieſcas, noſque ab infirmo deſiderio, ad contemplationem virtutum tuarum voces, quas neque lugeri, neque plangi fas eſt! Admiratione te potius temporalibus laudibus, et ſi natura ſuppeditet, militum decoramus!* † "If there be any habitation for the ſhades of the virtuous; if, as philoſophers ſuppoſe, exalted ſouls do not periſh with the body; may you repoſe in peace, and recall us from vain regret, to the contemplation of your virtues, which allow no place for mourning or complaint! Let us adorn your memory, rather, by a fixed admiration, and, if our natures will permit, by an imitation of your excellent qualities, than by temporary eulogies!" ‡

* Tickell's Poem on the Death of Addiſon.

† Tacit. Vit. Agricolæ.

‡ See Dr. Aikin's Tranſlation of the Life of Agricola.

THOUGHTS

## THOUGHTS *on the* STYLE *and* TASTE *of* GARDENING *among the* ANCIENTS. *by* WILLIAM FALCONER, M. D. F. R S, &c. *Communicated by Dr. Percival. Read December* 11, 1782.

THE moſt early account we have of a Garden, is contained in the Sacred Writings, in the deſcription of the habitation of our firſt parents. The form, diſpoſition, and arrangement are not particularly deſcribed. It is only ſaid, to have contained every tree, "that is pleaſant to the eye, and good for food;" * and that it was watered by a river, which, no doubt, added to the beauty of the proſpect, (which, in the expreſſion before cited, ſeems to have been particularly conſulted,) as well as to the fertility of the ſoil. Wood and water, therefore, both for ſhade † and ornament, the principal points aimed at in modern gardens, may be preſumed to have been here in the higheſt perfection. Farther than this, we are not informed.

The next hints concerning Gardens, that I can

* Geneſis, Chap. ii. ver. 9.

† And Adam and his wife hid themſelves from the preſence of the Lord, among the trees of the Garden.
Geneſis, Chap. iii. ver. 8.

diſcover

diſcover in the Sacred Writings, are to be found in the Song of Solomon, part of the ſcene of which is, undoubtedly, laid in a garden.* Flowers and fruits are particularly ſpoken of, as the ornaments, and the produce of it; and beſides theſe, aromatic vegetables† formed a conſiderable part of the gratifications it afforded. Fountains, and ſtreams of water appear, alſo, to have had a ſhare in the compoſition, and, probably, for ornament, as well as uſe. Statues, or paintings are not mentioned in theſe deſcrip-

* I am the roſe of Sharon, and the lily of the vallies.

Chap. ii. ver. 1.

A garden incloſed, is my ſiſter, my ſpouſe; a ſpring ſhut up, a fountain ſealed. Thy plants are an orchard of pomegranates, with pleaſant fruits, camphire, with ſpikenard, ſpikenard and ſaffron, calamus and cinnamon, with all trees of frankincenſe, myrrh, and aloes, with all the chief ſpices. A fountain of gardens, a well of living waters, and ſtreams from Lebanon. Awake, O north wind, and retire thou ſouth, blow upon my garden, that the ſpices thereof may flow out. Let my beloved come into his garden, and eat his pleaſant fruits.

Chap. iv. ver. 12. et.

† Aromatic plants are very often mentioned as a high gratification, and perfumes, to this day, are much admired in the eaſt. "His cheeks, are a bed of ſpice, with ſweet flowers, his lips like lilies, dropping ſweet ſmelling myrrh." Ch. v. ver. 13. "I will get me to the mountain of myrrh, and to the hill of frankincenſe."

Ch. iv. ver. 6.

tions,

tions, and, probably, had no place among their embelliſhments.

It is proper to remark, that all the beauties of theſe gardens were confined within themſelves. No beauty of proſpect, or variety of ground is mentioned, and for obvious reaſons. The privacy of a place, deſtined, in a great meaſure, for the confinement of women, prevented the former, and the limited bounds of the extent of the garden, would not admit of the latter.

It appears probable, that, at that time, they were uſed to have houſes in their gardens, wherein, particularly in hot weather, they were accuſtomed to ſleep at nights, which probably, was a great part of the gratification reſulting from them. A dwelling is mentioned in the Song of Solomon, that ſeems to have ſtood in the garden, and was probably of this kind;* and it is likely, that "the pleaſant houſes," mentioned by Ezekiel,† were of a ſimilar nature.

I am inclined to think, that ſome ever-green trees, particularly ſome of the terebinthinate

* Chap. v. ver. 1, &c.

† Chap. xxvi. ver. 12.

Dr. Ruſſel ſays, that it is cuſtomary for the principal perſons at Aleppo to live at their gardens during the month of April, and part of May. They live under tents, and perhaps tents might be uſed in the inſtance cited.

Ruſſel's Aleppo, p. 135.

kind,

kind, were favourite ornaments of the Jewiſh gardens.

The cedar is often mentioned, as a tree highly ornamental; and both that and the fir are ſpoken of in the book of the prophet Ezekiel, * as being frequent in magnificent gardens. Dr. Ruſſel † likewiſe mentions, that, at preſent, at Aleppo a cypreſs tree is generally planted in the little gardens, in the inner courts of the houſes, as well as in their more extenſive ones.

The next deſcription of a garden, in order of time, appears to be that of Alcinous by Homer, This has been, generally, eſteemed to be a fruit garden for uſe merely, without any view to ornament. But, I do not take this to be altogether its character, though it ſeems to be ſo in a good meaſure. Something of parterre, ‡ planted with flowers,

* The cedars in the garden of God could not hide him, the fir trees were not like his boughs. Ezekiel. xxxi.

† Ruſſel's Aleppo, p. 5.

‡ Ενθα δε κοσμηται πρασιαι παρα νειατον ορχον
Παντοια πεφυασιν επηετανον γανοωσαι.

Homeri Iliad. L. VII.

Athenæus, and the Scholiaſt on Homer, underſtand pot herbs only to be meant in this place; but the words κοσμηται and γανοωσαι ſeems too ornamental to be ſo underſtood, and to be rather applicable to flowers. At any rate, they were planted in parterre-like diviſion, as the word πρασιαι ſignifies.

" Ad

flowers, appears to have compoſed a part of it; and, probably, Homer would not have beſtowed ſo particular, and laboured a deſcription upon the trees, if they had not contributed to the beauty of its appearance, as well as to the furniſhing of the table with fruits.

The hanging gardens of Babylon come next, I believe, in order of time. Theſe ſeem, in many reſpects, to have been laid out with good taſte. Their elevation, not only produced a variety and extent of view, but was, alſo, uſeful in moderating the heat, which, I ſuppoſe, might be the principal reaſon, why ſuch a conſtruction was fixed upon; though, another is aſſigned, referring only to the ſimilarity of appearance. Such a ſituation would, likewiſe, ſuit a greater variety of trees, and plants, than a plain ſurface, and would contain a larger, as well as a more diverſified extent.

The ſuiting of the ſituation, to the nature of the trees, ſeems, from the account given by

" Ad olerum conſitionem quadratæ diſpoſitiones quæ πρασιαι dicuntur in laterculi formam" Columella.

ως τα πλινθια—Scholiaſt. on Homer.

Was this diviſion of the garden of Alcinous, ſimilar to the garden of herbs, mentioned in the Book of Kings, into which Ahab wiſhed to convert Naboth's vineyard?

Joſephus,

Joſephus, to have been one view,* in the erecting the building in ſuch a manner. And the ſucceſs ſeems to have been anſwerable, as the trees are ſaid to have flouriſhed extremely well, † and to have grown as tall as in their native ſituations. On the whole then, however different theſe may appear from modern gardens, I muſt confeſs, I think they were formed with judgment and taſte, and well adapted to the ſituation and circumſtances.

It appears, from the nature of the ſtructure, that the trees, here, ſhould be planted regularly, in rows and ranks; but this was alſo in the Perſian taſte. The garden of the younger Cyrus at Sardis, which was all planted with his own

* - - - εν δε τοις βασιλειοις τουτοις αναλημματα λιθινα υψηλα ανωκοδομησας και την οψιν αποδους ομοιοτατην τοις ορεσι καταφυτευσας δενδρεσι παντοπαδοις εξειργασατο και κατασκευασας τον καλομενον κρεμαστον παραδεισον

Joſeph. contra Apionem, L. I. § 19. Extr.

† Το δε εδαφος εξωμαλισμενον πληρες ην παντοδαπων δενδρων των δυναμενων κατα τε το μεγεθος και την αλλην χαριν τοις θεωμενοις ψυχαγωγησαι. Diod. L. II.

Stipites earum octo cubitorum ſpatium craſſitudine æquent: inquinquaginta pedum altitudinem emineant, et frugiferæ æque ſunt, ac ſi terra ſua alerentur.

Quint. Curt. L. V.

hands,

hands, was laid out in ſtraight lines,* and, at right angles, which was, no doubt, eſteemed the eſtabliſhed cuſtom, of placing the trees in gardens.

It does not, as far as I can find, appear clearly, that flowers made a part of the ornaments of theſe gardens; but, we may conjecture, they did, from the odours mentioned to be exhaled from the plants growing there,† which were underſtood to conſtitute no ſmall part of the pleaſure they afforded.

It ſeems probable, from ſeveral circumſtances, that the eaſtern gardens were adjoining to the houſe or palace, to which they belonged. Thus, King Ahaſuerus goes immediately, from the banquet of wine, to walk in the garden of the palace.‡ The garden of Cyrus, at Sardis, mentioned by Xenophon,‖ was probably contiguous to the palace, as was that of Attalus,

* Επει δε εθαυμαζεν αυτον ο Λυσανδρος ὡς καλα μεν τα δενδρα ειη, δι' ισου δε τα πεφυτευμενα, ορθοι δε οι σιιχοι των δενδρων, συγωνια δε παντα καλως ειν. Xenoph. Œconom.

† Οσμαι δε πολλαι και ηδειαι συνπαρομαρτοιεν αυτοις περιπατουσι Ibidem Xenoph.

Και ταυτα μετ' ηδιστων οσμων και θεαματων παρεχει. Ibidem Xenoph.

‡ Eſther, Chap. vii. ver. 7. ‖ Œconom.

mentioned

mentioned by Juſtin.* The hanging gardens of Semiramis, at Babylon, were not ſo much adjacent to the palace, as a part of the palace itſelf, as ſeveral of the royal apartments were beneath them.†

Parks, alſo, which may be looked upon, ſomewhat, in the light of gardens, were common in the eaſt. The younger Cyrus, we are told by Xenophon,‡ had a park at Celænæ in Phrygia, ſtocked with wild beaſts, for the purpoſes of hunting. Plutarch‖ ſpeaks of another, belonging to Tiſſaphernes; and incloſures of a ſimilar kind, are mentioned by other writers.§

* Juſtin. L. XXXVI. C. 4.

† Αι δε ευριγγες τα φωτα δεχομεναι ταις δι αλληλων υπεροχαις πολλας και παντοδαπας ειχον διαιτας βασιλικας.
Diodor. Lib. II.

‡ Ενταυθα Κυρω βασιλεια ην και παραδεισος μεγας αγριων θηριων πληρης, ἃ εκεινος εθηρευεν απο ιππου οποτε γυμνασαι εαυτον βουλοιτο τε και τους ιππους. Anabaſ. L. I.

‖ Vita Alcibiadis.

§ Παραγινεται δε και εις περιβολον, ον βασιλεως θηραν εκαλουν. ην δε τι τειχιον χωριον απειληφος ενδον πολυ, δενδρεσι πεφευτευμενον παντοδαποις. εν τουτω θηριων παντοιων εναποκλειομενα γενη, τροφης τε ουκ ηπορευοντο, δια το και ταυτην επεισαγεσθαι, και παρειχον τω βασιλει του θηραν, ηνικα αν βουληθειη, ραστωνην.
Zozimi. L. III. C. 23.

Venationes Regis eſſe in Babylone, et omnis generis beſtias murorum ejus tantum ambitu coerceri.
Sanct. Hieronym. in C. XIII. Eſaiæ.

What

What, the taſte for gardening was, among the Greeks, I do not underſtand. The Academus, we know, was a woody ſhady place;* and the trees appear to have been of the olive ſpecies.† It was ſituated, beyond the limits‡ of the walls, and adjacent to the tombs of the heroes. I do not, however, find any particular account in ancient hiſtory, of the manner, in which this grove was diſpoſed or laid out. It appears, however, to have been an elegant ornamented place.§ At the entrance was an altar dedicated to Love, which was ſaid to be the firſt erected to that Deity. Within the Academus, were the altars of Prometheus, of the Muſes, of Mercury, Minerva, and Hercules; and, at a ſmall diſtance, was the tomb of Plato. So that, in all probability, it was highly adapted by art, as well as nature, to philoſophic reflection and contemplation.

We are told by Plutarch, that before the time of Cimon, the Academus was a rude and un-

* Atque inter Sylvas Academi quærere verum.
Horat. Epiſt. L. II. I. 46.

† Αλλ' εις Ακαδημιαν κατιων, υπο ταις μοριαις αποθρεξεις.
Ariſtoph. Νεφελαι. Act. III. Sc. 3.

‡ - - - γυμνασιον προαστειον αλσωδης.
Diog. Laert. Vit. Platon.
Non longe a Muris Academia eſt. Pauſan. Attica.

§ Pauſaniæ Ibidem.

cultivated ſpot: but that it was planted by that General, and had water conveyed to it;* whether this water was brought merely for uſe to water the trees, or for ornament, does not appear. It was divided into gymnaſia, or places of exerciſe, and philoſophic walks, ſhaded with trees. Theſe are ſaid to have flouriſhed very well, until deſtroyed by Sylla,† (when he beſieged Athens) as well as thoſe in the Lyceum.‡

Near the Academy, were the gardens of the philoſophers,§ of Plato,‖ and of Epicurus,¶ which, however, were probably but ſmall.

The ſcene of Plato's Dialogue concerning Beauty, is elegantly deſcribed, as being on the

* Την Ακαδημιαν εξ ανυδρου και αυχμηρας· καταρρυτον αποδειξας αλσος ησκημενον υπ' αυτου δρομοις καθαροις και συσκιοις περιπατοις. Plutarch Vit. Cimon.

† Επεχειρησε τοις ιεροις αλσεσι, και τηντε ακαδημιαν εκειρε δενδροφορωτατην πρασειων ουσαν, και το λυκειον. Vit. Syllæ.

‡ The trees in the Lyceum were probably Plane trees. Varro quotes Theophraſtus, for the relation of the large ſize and extent of the roots of one in that place.

De re ruſtica, Cap. XXXVII.

§ Ομοιως δε και η ακαδημια και οι κηποι των φιλοσοφων. Strabon. L. IX.

‖ - - - - cujus (Platonis) enim hortuli propinqui non memoriam ſolum mihi afferunt, ſed ipſum videntur in conſpectu meo ponere. Cicero de finib. L. V.

¶ In Epicuri hortis, quos modo præteribamus. Ibidem:

banks

banks of the river Iliſſus, and under the ſhade of the Platane; but no artificial arrangement of objects is mentioned, nor any thing which will lead us to imagine the proſpect to be any other than merely natural. The beauty of this deſcription was ſo much admired, by ſucceeding writers of philoſophic dialogues,* that it was frequently imitated, and, at laſt, to ſuch a degree, that it appeared ridiculous and diſguſtful, as we may ſuppoſe from the caution given by Plutarch† againſt ſuch attempts, in the proems to diſcourſes.

The Romans ſeem to have early imbibed ſomewhat of a taſte for gardens.

Tarquin the Proud, is ſaid to have communicated his intentions to his ſon, concerning his conduct to the people of Gabii,‡ by ſtriking off the heads of the flowers in his garden.

* Cicero was a great admirer of this paſſage in Plato: Quæ (Platanus) videtur non tam ipſa aquula quam Platonis oratione creviſſe. De oratore, Lib. I. § 15.

† Αφελε τε λογου το νυν εχον εμποιων τε λειμωνας και σκιας και αμα και λακκων διαδρομας και οσα αλλα τοιουτων τοπων επιλαβομενοι γλιχονται τυ Πλατωνος Ιλισσον και τον αγνον εκεινον και την ηρεμα προσνατη ποαν πεφυκιαν προθυμοτερον η καλλιον επιγραφεσθαι. Plutarch Amator. ad Initium.

‡ Livii Lib. I. Cap. 54. Luc. Flor. C. 8. Dionyſ. Italic. It appears from all theſe accounts, that the garden was adjacent or contiguous to the palace.

I ſee but little mention made of a garden, otherwiſe than as a matter of utility, to produce articles of food, for many years after; though I think it probable, they might be as matters of pleaſure alſo. The writers, however, on huſbandry, Cato, Varro, Columella, and Palladius, make not the leaſt mention of a garden, as an object of pleaſure, but ſolely, with reſpect to its productions of herbs and fruits; and I do not imagine it was among the earlieſt articles of Roman luxury. The Lucullan gardens ſeem to be the firſt I can find mentioned, of remarkable magnificence; though, probably, from the height of extravagance to which theſe were arrived, they were not the firſt. Plutarch ſpeaks of them, as incredibly expenſive, and equal to the magnificence of kings.* They contained artificial elevations, of ground to a ſurprizing height, of buildings projected into the ſea, and vaſt pieces of water made upon land. In ſhort, his extravagance and expence was ſo great, that he acquired from thence the appellation of, the Roman Xerxes.

* Plutarch. Life of Lucullus.

Salluſt is thought to have alluded to the Villa of Lucullus when, in deſcribing the Roman luxury, he ſays, "Nam quid ea memorem, quæ, niſi his qui videre, nemini credibilia ſunt; a privatis compluribus ſubverſos montes, maria conſtrata eſſe." Bell. Catilin.

It

It is not improbable, from the above account, and from the conſideration of Lucullus having ſpent much time in Aſia, in a ſituation, wherein he had an opportunity of obſerving the moſt ſplendid conſtructions of this kind, that theſe gardens might be laid out in the Aſiatic ſtyle.

The vaſt maſſes of building, ſaid to have been erected, might have borne ſome reſemblance, in the arrangement and ſtyle, to the Babylonian gardens; and the epithet of the Roman Xerxes might be applicable to the taſte, as well as the ſize and expence, of his works.

The Tuſculan Villa of Cicero, though often mentioned, is not, as far as I can diſcover, any where deſcribed in his works, ſo as to give an adequate idea of the ſtyle, in which his gardens or grounds were diſpoſed.

There is but little in Virgil, that I can find, relative to this ſubject. Pines,* it ſeems probable, were a favourite ornament in gardens, and flowers, † roſes eſpecially, were much eſteemed.

* Fraxinus in ſylvis pulcherrima, pinus in hortis,
Populus in fluviis, abies in montibus altis:
Sæpius at ſi me, Lycida formoſe, reviſas,
Fraxinus in ſylvis cedet tibi, pinus in hortis.
Virgil, Eclog. VII. l. 65. &c.

† Forſitan et, pingues hortos quæ cura colendi
Ornaret, canerem, biferíque roſaria Pæſti:
Quóque modo potis gauderent intyba rivis,

teemed. Some plants alſo, of the culinary kind, as the endive, the parſley, and the cucumber, were ſometimes either planted as ornaments, or elſe intermixed with plants of that kind, contrary to modern practice.

I apprehend that flowers and ſhrubs were planted full as much among the Romans, for the ſake of their odour, as the beauty of their appearance.* Perfumes were always highly valued in warm climates. Virgil places Anchiſes † in Elyſium, in a grove of bays, and is careful to remark, that they were of the ſweet ſcented kind.‡ The Pæſtan roſes were chiefly valued for their excellent perfume; and the ſame quality appears to be the cauſe, why they were placed by Tibullus ‖ as ornaments to the Elyſian fields.

Et virides apio ripæ, tortúſque per herbam
Creſceret in Ventrem cucumis; nec ſera comantem
Narciſſum, aut flexi tacuiſſem vimen acanthi,
Pallentéſque hederas, & amantes litora myrtos.
Georgic, L. IV. L. 118.

* See Athenæus paſſim, & Anacreon.
Jactat odoratos Vota per Armenios. Tibulli, L. I. Eleg. 5.

† Inter odoratum lauri nemus. Virg. Æneid. VI.

‡ Calthâque Pæſtanas vincet odore roſas.
Ovid. Ep. de Pont. L. II. El. 4.

‖ Floret odoratis terra benigna roſis.
Tibulli L. I. Eleg. 3.

Athenæus ſpeaks of the roſe, entirely with a view to its odour. L. XV. p. 681, 682, edit. Caſaubon.

I muſt

I muſt not paſs over one piece of Roman luxury, relative to gardens, wh[illegible] is equally prevalent at preſent, viz. the endeavour to produce flowers at ſeaſons of the year, not ſuited to their time of blowing.

Roſes were then as at preſent, the principal flowers, upon which theſe experiments were tried, as appears from Martial and others. *

The next accounts of ancient gardens I can meet with, are thoſe of Pliny, which, we may conjecture, were not only laid out according to his own taſte, but that, alſo, of the age in which he lived.

* Ut nova dona tibi, Cæſar, Nilotica tellus
Miſerat, hibernas ambitioſa roſas.
Navita deriſit Pharios Memphiticus hortos,
Urbis ut intravit limina prima tuæ.
Tantus veris honos, et odoræ gratia Floræ,
Tantaque Pæſtani gloria ruris erat.
Si quacumque vagus greſſum oculoſque ferebat,
Textilibus ſertis omne rubebat iter.
At tu, Romanæ juſſus jam cedere brumæ,
Mitte tuas meſſes, accipe, Nile, Roſas.
Martial. Epigr. L. VI. Ep. 80.

Dat feſtinatas Cæſar tibi bruma coronas:
Quondam veris erant, nunc tua facta roſa eſt.
Epigr. L. XIV. Epig. 127.

Æſtivæ nives, hibernæ roſæ. Lamprid. Vit. Elagab.

His account of his Laurentine Villa,* relates but little to the external arrangement of gardens and ground, but is confined chiefly to the houſe.

It appears, however, that the Geſtatio,† or place for horſe exerciſe, was bordered with box, and where that was defective, with roſemary intertwined with vines. It appears, alſo, that the Geſtatio ſurrounded the garden.‡ The Xyſtus‖ likewiſe, or place for foot exerciſe, was planted with violets, which ſeem to have been placed there, on account of their odour. His deſcription of his Tuſcan Villa** is more particular. This ſeems to have poſſeſſed great natural beauties, to which its poſſeſſor attended with great judgment. Its ſituation appears to have been healthy, and remarkably cool; inſomuch, that the olive and the myrtle would not thrive, nor perhaps, even grow there. This

* The Laurentine Villa, we are told by Pliny himſelf, was calculated more for uſe than ornament. "Villa uſibus capax, non ſumptuoſa tutela."

Plin. Epiſt. L. II. Ep. 17.

† Geſtatio buxo aut rore marino ube deficit, buxus ambitur. Adjacet geſtatione interiore circuitu vinea tenera et umbroſa. Ibidem Plinii.

‡ Hortum et geſtationem videt quâ hortus includitur.

Ibidem Plinii.

‖ Ante Cryptoporticum Xyſtus violis adoratus. Ibidem.

** See Pliny's Letter to Apollinaris.

Lib. V. Epiſtol. 6.

circum-

circumſtance, owing probably, to its proximity to the Appennine mountains, fitted it for a ſummer reſidence. It was placed in the midſt of a vaſt natural amphitheatre, ſurrounded with hills crowned with lofty and venerable woods: Small riſing grounds of great fertility here and there occurred, which were planted on their ſides with vines, and ſurrounded with ſhrubs and under-wood. The lower grounds were full of flowers and plants, always green and flouriſhing, and, probably, on account of the difference of temperature of the ſituation, varying from thoſe of the ſurrounding country. What added to the beauty of this ſcene was, that it was plentifully watered by many rivulets from the adjacent hills, which the coolneſs of the ſituation prevented being dried up by the ſummer heats. No marſhy places were, however, to be found, but the whole of the ſuperabundant moiſture was carried off into the Tyber, which ran through the middle of the proſpect, and completed the beauty of the ſcene, not only as a piece of water, but alſo, as a navigable river. The Villa of Pliny was ſituated upon one of thoſe riſing grounds before mentioned, and enjoyed a diſtant and varied proſpect; though the aſcent to the place on which it ſtood was ſo gradual, as ſcarcely to be ſenſible to thoſe who went up to it.

After

After this account of the natural beauties of this elegant ſituation, which its noble poſſeſſor ſeems to have been thoroughly ſenſible of, and to have entered into with the higheſt taſte and delight, we are ſurprized and ſorry, to ſee the artificial part of the proſpect, form ſo diſgraceful a contraſt. The Xyſtus, or court before the portico, for walking and exerciſe, was parted into numerous diviſions of diverſe ſhape, all edged with box. The ſlope lawn, or deſcent from thence, was bordered on the ſides with figures of beaſts, cut in box trees. The interior ſpace ſeems to have been planted (probably here and there only) with acanthus. Theſe were ſurrounded by a walk, ſhaded by ever-greens, ſhorn into different ſhapes: and the whole again incircled by a riding path, which was ſecured on the outſide by a wall, or rather mound of earth, covered with box trees, riſing one row above another, in form of ſteps. Oppoſite to the middle of the portico, there was a ſmall court, ſurrounded by a ſummer-houſe, and ſhaded by four plane trees, in the midſt of which, a fountain aroſe into a marble baſon, and running over the edges, ſprinkled the trees and the graſs underneath. In the front of the buildings, lay a plantation of trees, in form of an Hippodrome, open in the middle, in order that its whole extent might be perceived at one view, and incircled with plane trees, covered with ivy, in ſuch a manner

manner, as that they appeared, in their lower parts, to be compoſed of that ſhrub, while their tops flouriſhed, in their native verdure and foliage.

The ivy, ſpreading from one tree to another, connected them together into an uniform appearance. Between each of the plane trees, box were planted, and behind theſe, bay trees, which blended their ſhade with that of the planes. This plantation formed a ſtreight boundary on each ſide of the Hippodrome, and, at the end, bent into a ſemicircular form, bordered with cypreſs trees, which ſerved to vary the proſpect, and to caſt a deeper and more gloomy ſhade; whilſt the internal circular walks, ſeveral of which there were, planted with roſes, formed a contraſt to the ſhade of the others. Theſe winding paths terminated in a ſtreight walk, which again divided into ſeveral others, ſeparated from one another by box hedges. In one place there was a little meadow; in another, the box was cut into a thouſand different forms; ſometimes, into letters, expreſſing the name of the maſter; ſometimes, that of the artificer; whilſt here and there, little obeliſks aroſe, intermixed alternately with fruit trees; and in the midſt of this regularity of arrangement, ſo ſuited to the taſte of the inhabitants of a great city, there aroſe an unexpected ſcene, reſembling the natural beauties of the

the country, in the center of which lay a ſpot, ſurrounded with dwarf plane trees.

Beyond theſe, was placed a plantation of acanthus, and, as you proceeded, the trees were cut out into various figures and ſhapes. At the termination, was an alcove ſeat, of white marble, ſupported by four ſmall Caryſtian marble pillars. Underneath the ſeat, the water guſhed out, through ſeveral ſmall pipes, as if preſſed out by the weight of thoſe who repoſed themſelves upon it. This water was again collected into a ſtone ciſtern beneath, and received, from thence, into a poliſhed marble baſon, ſo artfully contrived, as to be always full without overflowing; though the means, by which this was brought about, were not obvious to the view. We are alſo told, that this baſon ſerved, ſometimes, as a table at ſupper, the larger diſhes being placed on the edge, whilſt the ſmaller ſwam about, in form of little ſhips, and wild fowl. Correſponding to this was a fountain, inceſſantly filling and emptying; the water being thrown up to a great heighth, and falling back into the baſon, from whence it ran off. Fronting the alcove, ſtood a marble Summer-houſe, with folding doors, projecting and opening into a green incloſure, ſo that, from the upper and lower windows you might diſtinguiſh a variety of different verdures. Seats of marble, with fountains by their ſides, were diſperſed through the gardens;

gardens; and throughout the whole Hippodrome, ſtreams of water were conveyed in pipes, to different ſpots, to water and refreſh the trees and verdure.

It is obvious, that the above deſcriptions bear, a ſtriking reſemblance to the taſte in gardens that prevailed in this country, and indeed throughout Europe, towards the beginning of the preſent century. The walks bordered with box and roſemary; the terrace planted with violets, at the Laurentine Villa; and the court divided into parterre diviſions, edged with box; the figures of animals cut out in box trees, placed oppoſite each other, upon the ſlope; with the ſurrounding walk, incloſed with tonſile evergreens cut into ſhapes, point out the ſame reſemblance, in the gardens at the Tuſcan Villa. The circular amphitheatre of box, cut into figures, and the walk, covered with graduated ſhrubs, are all exactly in the ſame ſtyle. The fountains overflowing; the marble baſons; the little jets d'eau about the ſeats, and under the alcove; the ſudden diſappearance of the water; the ſpouts in the graſs; the regular diſpoſition of the trees in the Hippodrome, in lines ſtraight, and regularly curved; together with the arrangement of the different kinds behind each other, make one think, Pliny was rather deſcribing a Villa of king William, or Louis XIV. than one of

of a Roman nobleman, and ſenator, ſeventeen hundred years ago.

Some circumſtances, in the above deſcription, appear in many reſpects, abſurd and exceptionable. But let us not be too haſty in our cenſures; but conſider, whether the nature of the climate and country may not vindicate them, in ſeveral reſpects, from the imputations which might have been juſtly aſcribed to them, under different circumſtances. The walks, bordered with box, a tree of cloſe growth, and ſaid to flouriſh extremely in that ſituation, formed a convenient ſhelter from the torrid rays of an Italian ſun. The ſhearing of the trees, contributed alſo to thicken their ſhade, and to render them more commodious for this purpoſe; though, I confeſs, it was not neceſſary, for this end, that they ſhould be clipped into awkward imitations of animals, &c. which, it is ſurprizing a man of the taſte of Pliny could approve. The fence to the garden was, in Pliny's Villa, concealed by trees, an improvement on the modern taſte referred to; a long range of bare brick walling having been often eſteemed an object of beauty or magnificence.

Fountains, likewiſe, and jets d'eau, however uſeleſs, and therefore abſurd and unnatural, in Great Britain and Holland, may ſtill be in perfectly good taſte in Italy. The diſperſion of moiſture cools the air, by the evaporation it produces;

duces; and the very murmur of the falling of water, gives the idea of coolneſs, by aſſociation of ſenſations. They ſeem here to have been diſpoſed with judgment, ſome of them being ſituated near the alcove, and reſting places, as a refreſhment to thoſe fatigued with heat, and exerciſe; and others, diſperſed through the graſs, not to cauſe a fooliſh ſurpriſe, and to endanger the health of thoſe paſſing that way, by wetting their cloaths, but to water the trees, cool the ground, and refreſh the verdure; circumſtances indiſpenſable to the beauty of the ſcenery and proſpect, in a hot climate.

The ſame apology may, I think, be made for the regularity of the walks, in the Hippodrome, and the minute parts and diviſions, in which it was diſpoſed.

It is probable, the extent of ground itſelf was not large. Diſtant walks would be fatiguing in an Italian ſummer, and would be too much trouble and expence to keep as cloſely ſhaded, as would render them ſufficiently agreeable. They were, therefore, in a manner, compelled to make as much as poſſible, out of the ſpace of ground; which they accompliſhed, by dividing it into as many walks and paths as poſſible.

The parterre, likewiſe, parted into beds of various ſhapes, was neceſſary for flowers, which were highly valued in warm climates for their perfume, but do not thrive, unleſs kept diſtinct

and

and free from the proximity of other trees, or plants.

It is remarkable here, that the taſte of the author, for the beauties of nature, breaks out among his deſcription of the moſt artificial ornaments. Immediately after deſcribing the fence of the garden, covered with graduated box trees, he adds, that the adjoining meadow, was as beautiful by nature, as the garden had been rendered by art; and, in another place, mentions the contraſt of the beauties of rural nature, with thoſe of art,* as one of the chief ornaments of his garden. The ſame apology that has been made for the ſtyle, in which Pliny's gardens were laid out, is applicable to the eaſtern gardens in general, and holds, ſtill more ſtrongly, as the heat becomes more conſtant and intenſe. We may farther obſerve, that this mode ſuits the diſpoſition of the eaſtern people, in many other reſpects. The regularity

* Juvenal appears to have poſſeſſed a good taſte in gardening, and laying out grounds, from what he ſays of the artificial grottoes at Aricinum, and the attempt to ornament the water, by ſubſtituting marble, in place of its natural boundary of herbage.

In Vallem Egeriæ deſcendimus, et ſpeluncas
Diſſimiles veris: quanto præſtantius eſſet
Numen aquæ, viridi ſi margine clauderet undas
Herba, nec ingenuum violarent marmora tophum?
Juvenal. Satyr. III. L. 17.

and

and formality of their manner of living, and manners, correſponds with their taſte for regular figures, and uniformity of appearance, in the laying out of ground. It may not, perhaps, be too great a refinement to remark, that ſuch a taſte is conformable alſo to a deſpotic government, which is jealous of all innovations, and, of courſe, affords no opportunity for exertions of genius, in any capacity. It is worthy of obſervation, that the regular taſte, above referred to, prevailed in this country, at a time when our ſyſtem of manners, dreſs, and behaviour was extremely ceremonious, formal, and reſerved, and approaching to thoſe of the eaſtern countries. As this ſtiffneſs wore off, the taſte of the people improved. Shakeſpeare was no longer cenſured for inattention to dramatic ſtrictneſs; the turgid, but regular bombaſt of Blackmore, fell into diſrepute and ridicule, and a more eaſy and natural ſtyle was adopted, both in ſentiment and writing.

The general method of laying out grounds, in this country, ſeems at preſent to be very rational. Natural beauties, or reſemblances thereof, are chiefly attempted; which are the more proper, as being more conformable to the climate and ſituation of the country, and diſpoſition of the people, who are beſt pleaſed with great and ſublime objects, which are to be found only in nature. The cloſe walk, how-

ever delightful in Italy, or Perſia, is here judiciouſly exchanged for the open grove, and the moiſture of graſs for gravel. The tonſure of trees is alſo laid aſide; not only as impairing their beauty, but alſo, as thickening their ſhade, more than would be neceſſary or agreeable, where a free intercourſe of air is ſo requiſite, to diſpel damps and exhalations. Fountains, on the ſame account, are laid aſide, and we are content with the natural current of ſtreams, which exhale leſs moiſture, [and produce leſs cold, than water ſpouted into the air by the fantaſtic, but leſs beautiful diſtribution of it by a jet d'eau. The gardens, or pleaſure grounds, in our country, are likewiſe very properly of much larger extent, than thoſe in hot climates. Pleaſure, in the latter, is always combined with ſomewhat of indolence and inaction; in the former, it is connected with exerciſe and activity. A large ſcope of ground, therefore, that afforded opportunity for the latter, would be more conformable to the genius of the people, as well as to the climate in which the luxurious indulgence, ſo delightful when the heat is intenſe, could very ſeldom be ſafely practiſed. On the whole, I am inclined to believe, that notwithſtanding our want of the ornaments proper for hot climates, in our gardens and pleaſure grounds, Great Britain is capable of affording more real and genuine beauty in views of this

this kind, than is, perhaps, any where elſe to be met with. The fine and regular verdure, which always clothes both the earth and the trees; the variety of the herbage, and the ſize to which oaks and other foreſt trees, congenial to the country, will arrive, impart a beauty and magnificence to our proſpects, and afford opportunities for the judicious interpoſition of art, far ſuperior to what is to be met with, where theſe advantages do not occur.

We are ſtruck with claſſic deſcriptions, and affected by the circumſtances which, by their connection, they recall to the memory; but ſetting theſe aſide, I make no doubt, a grove of Engliſh oaks would be a more beautiful, as well as a more magnificent object, than "the olive grove of Academe," or that of plane trees in the Athenian Lyceum.

After all, it is poſſible to err in too cloſely following Nature, as it is in neglecting her. There are beauties of the artificial kind, as well as natural, which are proper to be introduced into ſcenes of this kind. Statues, buildings, and other ornaments, in good taſte, and well executed, may unite with great propriety with natural objects, and heighten their effect. I do not ſpeak of theſe ornaments, as to any particular beauties they may individually poſſeſs, but merely as coinciding with the general effect, and nature of the proſpect. They are, however, to

be employed cautiouſly, ſince, if injudiciouſly, or even too frequently introduced, they give an air of frivolouſneſs and affectation to the whole, which renders it an object of contempt and ridicule, rather than of admiration.

More, I think, might be ſaid againſt excluding parterres of flowers, which were ſo conſtant attendants upon the old gardens, and ſo rarely ſeen at preſent. We all know, that ſeveral kinds of flowers are exquiſitely beautiful, and that their beauty and perfection depends on certain circumſtances, relative to their culture. Great care is neceſſary, and a ſeparation from other plants, both of which ſuggeſt the parterre as the moſt proper and convenient way of producing them. I confeſs, parterre diviſions poſſeſs no remarkable beauties in themſelves, but I think, at the ſame time, that they have nothing ſo ſhocking, to the moſt delicate taſte, that ſhould hinder their being employed, when they are the harbingers of ſuch beautiful productions of nature. A ſquare, or an oblong border, has nothing obviouſly abſurd or diſguſting in its appearance; and as to its being artificial, it may be ſaid in defence of it, that it is not an imitation of any thing in nature, nor meant to be ſo, but ſolely calculated for utility, as an inſtrument neceſſary to the production of beauty; and, conſidered in this view, we might, with equal reaſon, object againſt a houſe, as an unnatural,

unnatural, and therefore, an improper object, as againſt the diviſions of a flower parterre.

I grant, indeed, that they have been whimſically, and often abſurdly arranged, and faſhioned; but ſuch I do not here defend. I only maintain the cauſe of parterres, on account of the beauties, which they are neceſſary to produce: not of any they themſelves poſſeſs.

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*On the* REGENERATION *of* ANIMAL SUBSTANCES. *By* CHARLES WHITE, *Eſq.* F. R. S. *&c. Read December* 18, 1782.

THE great Author of the creation has endowed the animal world with a wonderful power of repairing and recruiting its various compound machines, and not only filling up and making good loſt ſubſtances, but in ſome inſtances, of even totally regenerating parts; but we muſt not from hence accuſe him of partiality, in not doing it in every inſtance; for the further we carry our reſearches into the ſecrets of Nature, the more we ſhall be convinced of the great and unbounded wiſdom of God, and of the extraordinary reſources he has placed in her poſſeſſion;

- - - - - - - " The firſt Almighty cauſe
Acts not by partial, but by general laws.
Pope's Eſſay on Man.

The Deity has drawn the line, has fixed the limits, and has ſaid to Nature, hither ſhalt thou go, and no further.

If this order does not appear to us to be uniformly preſerved, we muſt not conclude that it is not really ſo, but that it is owing to our ſlender capacities, that we are unable to trace his hand through all his ways,

" See and confeſs, one comfort ſtill muſt riſe,
" 'Tis this, tho' man's a fool, yet God is wiſe."
Loc. citat.

The ancients knew that a freſh broken bone would unite by a callus, that wounds of the fleſh would fill up by what is called incarnation, and would be healed over with ſkin, by what is called cicatrization. But all vain-glorious boaſting man muſt not from hence pretend, that he can make a ſingle fibre grow: this is the act of Nature only. The ableſt ſurgeon living, can do no more than aſſiſt her, remove the preſent obſtacles, and prevent others being thrown in her way.

" Yes Nature's road muſt ever be preferr'd;
" Reaſon is here no guide, but ſtill a guard."
Loc. citat.

The moderns have carried this matter further.

I did myſelf the honour to lay before the Royal Society, a remarkable caſe of a broken bone,

bone, which was inſerted in the Philoſophical Tranſactions, vol. LI. part the ſecond, for the year 1760, in which Nature was diſappointed of her uſual method of throwing out a callus, and after more than ſix months had elapſed, without an union; when all obſtacles were removed, by cutting off the ends of the bone, the oſſeous matter ſhot out as freely as if it had been from a recent fracture, and the broken bone was perfectly united. Since the publication of this caſe, a great number of ſimilar ones have occurred both to myſelf and others, which inconteſtably prove, that though Nature is diſappointed in her work, even for a long time together, yet, when all obſtructions are removed, ſhe is ever ready to exert herſelf.

In the year 1768, I cut off the upper head of the os humeri of Edmund Pollit, aged fourteen, whoſe caſe is related in the LIX. volume of the Philoſophical Tranſactions. This was much corroded with matter, part of it conſumed, and followed by an exfoliation of a large piece of the whole ſubſtance of the bone; yet the head neck, and part of the body of it were actually regenerated, and the entire uſe of the joint preſerved.

Mr. William Johnſton, ſurgeon at Dumfries, has given us a caſe in the Edinburgh Medical Eſſays,* where the whole tibia, the principal

* Vol. V. p. 452.

bone of the leg, being caſt off by exfoliation, was regenerated, and was, in a little time, as uſeful as the old one.

Mr. Le Cat mentions a caſe in the Philoſophical Tranſactions,* of a child of three years old, from whom he extracted the entire tibia, exoſtoſed and carious in its whole extent, between the two articulations; which had remained ſound: this great deficiency of bony ſubſtance was entirely ſupplied again by nature, and the patient regained a new tibia, much firmer than that which he had loſt.

In the ſame place, he relates the caſe of an adult perſon where he took out three inches and ten lines of the bone of the upper arm, which was followed by a regeneration of bony matter. In this caſe the form of the bone, as well as its natural length, was preſerved, †

Both in compound luxations and in caries,‡ the heads of the principal bones, and conſiderable portions of their bodies have been ſawn off, and regenerated, ſuch as the tibia, fibula, humerus, radius, ulna, thumb, and finger; the bones were little or no ſhorter, and new joints were formed, with ſuch a degree of motion, that the patients found little or no inconvenience, and were able to follow their buſineſs as well as ever.

* Vol. LVI. p. 270.

† Gooch's Caſes, vol. I. p. 323.

‡ Phil. Tranſ. vol. LIX. p. 39.

Dr.

Dr. Hunter, in his reflections on cutting the ſymphyſis of the pubis,* ſays, "as to any property which living ligaments poſſeſs of ſtretching, under violence, permitting diſlocations without laceration, I have long taught, that though a very general opinion, it ſeems not to have been founded in obſervation. Ligaments will not allow of diſlocations in dead bodies without laceration; and elaſticity to any degree either in ligaments or tendons, would ill agree with their uſe in living bodies, which is to keep the parts ſtrongly together; and accordingly, ſince this opinion has rouſed attention and examination, every caſe of a recent diſlocation that I have known examined, has been found complicated with a laceration of the ligaments."

Mr. John Hunter, in his Chirurgical Lectures goes further, and ſays, "that a luxated bone not reduced, by preſſing againſt another bone, digs a cavity for itſelf, which gets cartilaginous edges and cartilage on all its ſurface; nay, a ſynovial gland ſecreting ſynovia, and a new joint is ſet up. In the fracture of a bone, though the parts be thrown at ſome diſtance, a callus is formed, which unites them. It is agreeable to the ſame uniformity of operation, that when a bone is broken, which was originally formed in a nidus of cartilage, the renovated bone alſo forms in cartilage; while a bone, originally formed in

* Letter to Dr. Vaughan, p. 86.

membrane,

membrane, when it is partially deſtroyed, is reproduced in membrane." All ſurgeons muſt have obſerved this, that in old diſlocations which have not been reduced, there is always ſome degree of motion more or leſs in the diſlocated joint, except it has been complicated with a fracture.

In a converſation I lately had with Dr. Monro, he confirmed Dr. Hunter's opinion, with the relation of the two following diſſections. He immerſed a dead child in warm water, till it was perfectly ſoft and flexible; he then diſlocated the ſhoulder. Upon diſſecting the parts, he found the capſular ligament lacerated.

A man in Edinburgh was killed by a fall from a horſe, and his ſhoulder was at the ſame time diſlocated. Upon diſſection in this caſe alſo, he found the capſular ligament lacerated.

Dr. Monro told me, he did not in the leaſt doubt what Mr. John Hunter had advanced on this ſubject; and informed me, that he had a caſe, laſt winter, of a patient who had an exfoliation of half the lower jaw, particularly of the whole condyle on the left ſide; the loſt part was regenerated, he had the entire uſe of the jaw, and the joint was as perfect as on the other ſide, except being a little fuller, and attended with a trifling degree of hardneſs. I had the ſatisfaction of ſeeing the exfoliated bone amongſt his valuable collection, and found the head of the bone perfect, except a little carious on one ſide.

In

In the ſame collection I ſaw an aſtragalus, (one of the bones of the foot) which had come away entire, and the patient, as Mr. Fyſe informed me, had the perfect uſe of his foot and ancle. I likewiſe ſaw in the ſame place, a thigh bone, which had been broken, the ends had not coaptated, but had overſhot each other three inches, and were perfectly united. Caſes of this ſort I have often ſeen, and have now a thigh bone by me, united in the ſame manner; but in that bone in the poſſeſſion of Dr. Monro, there is this circumſtance, which I had never before obſerved, that the ſides of the bone had not approximated each other, but in one point. The callus had ſhot out in ſuch a manner as to form cancelli, and the void ſpace had all the appearance of having contained a medullary ſubſtance. Dr. Monro told me he had a whole cheſt of regenerated bones in his poſſeſſion. He likewiſe deſcribed to me the following experiment, he had made.

He laid open the abdomen of a pig for ſeveral inches, in ſuch a manner, that the inteſtines protruded; which convinced him, that all the integuments were completely divided. He then reduced the inteſtines, and ſewed up the wound. After it was perfectly united, he killed the pig. He then made inciſions above and below, and on one ſide of the cicatrix; after which, he injected the aorta; and, though there was not a poſſibility

of

of the injection entering but on one side of the cicatrix, yet the arteries, on both sides, were perfectly injected, a convincing proof, that they must have regenerated, for it cannot be supposed that the mouths of so many small vessels could possibly have coaptated, so as to have continued the circulation through the cicatrix. I had the satisfaction of seeing both the preparation and an engraving from it, which, it is hoped, the doctor will favour the public with, together with the several other valuable experiments.*

Teeth have regenerated in every period of life. Mr. Thornton, a very ingenious medical student at Edinburgh, informed me, that he had a sound tooth drawn by mistake some years ago, which as soon as he found out he immediately replaced. It grew again, and was as good in every respect as any other. But in process of time, this tooth began to decay, and give him pain, which became exquisite whenever the tooth was touched, even in the slightest manner. He therefore had it drawn, and one of the fangs was found to be carious. From this it is very evident, that nerves will grow again, after being disunited.

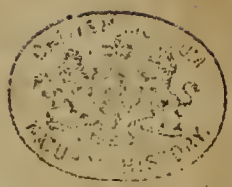
* Since this paper was read before the Society, Dr. Monro has published his useful and ingenious observations on the nervous system, with the engravings of these preparations. Vid. Tab. XLVI. and Tab. XLVII.

Mr.

*Plate III*

*ad vivum delin.t G. Bew.*

*The Dotted Line shews the place where the Arm was Amputated.*



Mr. Cruikſhanks, in his Letter to Mr. Clare, p. 87, ſays, "Not only the brain, but the nerves alſo, appear to have other properties than we have hitherto apprehended. Some years ago, I demonſtrated, by experiments on living animals, that nerves divided unite again; and that when portions had been cut out, they were regenerated: in both inſtances the animals perfectly recovered. Theſe experiments I hope ſoon to be able to lay before the public; meantime I am happy to find, they have been recently confirmed by ſo great authority, as the Abbè Fontanà, to whom I communicated my diſcovery, and ſhewed my preparations of united and regenerated nerves."*

Mr. Gooch has given us a remarkable caſe of the cuticle and nails,† being frequently caſt off and regenerated, particularly in the feet and hands, ſometimes twice in a year. Thoſe of the hands were caſt off whole, and we are furniſhed with an engraving of a pair of theſe cuticular gloves.

* Dr. Monro, in the work before mentioned, has given a plate (Vid. Tab. XIV.) to ſhew the regeneration of the ſciatic nerves, which had been divided in living frogs, and diſſected twelve months after. The regenerated parts are of a darker colour than the original nerves, which proves, that there was not a mere coaptation of the divided ends.

† Philoſophical Tranſactions, vol. LIX. p. 281.

There

There is another ſimilar caſe related by Mr. Latham,* but with this difference, that this patient did not caſt her nails.

By performing the operation for the cure of the aneuriſm, ſeveral inches of the trunks of the principal arteries, both of the arm and the thigh, have been deſtroyed; yet in a few days, the circulation through the whole limb, has been carried on, as perfectly, as before the operation. The method, which nature has taken for accompliſhing this buſineſs, may be ſeen by an engraving† from a preparation which I made, and which Dr. Hunter has done me the honour to give a place amongſt his valuable collection.

There is a very extraordinary hiſtory of a glans penis regenerated after amputation, related by Mr. Jamiſon, ſurgeon at Kelſo, and inſerted in the Edinburgh Medical Eſſays.‡ The young man was married, in that country, about two years after the cure, has had two children, and complains not of want or defect even in ſenſation.

Crabs and lobſters caſt their ſhells, both from their bodies, legs, and claws, and even caſt their ſtomachs, generally every year, which are immediately regenerated. The ſhell is renewed by a fluid, which they eject; and it inveſts their whole body, growing hard and dry, in a ſhort

* Philoſ. Tranſactions vol. LX. p. 451.

† See my Caſes in Surgery, p. 140.

‡ Vol. VI. p. 434.

time,

time, and becoming as ſtrong a ſhell, as that which they had before. But, what is more extraordinary, they frequently loſe a leg or a claw in their combats, which are very frequent and furious: the loſt part will be regenerated in about three weeks, and be almoſt of its natural ſize. Brown, in his hiſtory of Jamaica, informs us, that the claw of the violet crab, in ſeizing its food, catches ſuch an hold, that the animal loſes its limb ſooner than its graſp; the claw continuing its retentive power for above a minute, whilſt the crab is moving off.

In the polypus, not only young ones will grow out like warts from different parts of the body, drop off, live, and grow; but you may cut them into a thouſand pieces, and turn them inſide out, and they will ſtill live, and do well; this is accounted for by its whole body being compoſed of ſtomach and parts of generation. The latter not being peculiar organs, but merely particles of the ſtomach, which are its body, each part of which has the power of producing the like. Its food is converted into chyle, in the ſtomach; abſorbents opening into the part, take up the chyle, and theſe, at ſome diſtance from their mouths, become arteries.

If the *Actinia Urtica Marina*, *Animal flower*, or *Sea Anemone* be cut through the middle, either tranſverſely or longitudinally, both parts will ſurvive the operation. Nay further, if you tear them

them from the rock or ſhell, to which they generally adhere, and a ſhred is left behind, it will become a freſh and perfect animal.

The earth-worm and ſea-worm will live after being cut in two; but, what is moſt ſurprizing, the ſmall red headed earth-worm, being cut in two, both extremities ſurvive the operation; the head produces a tail, with the anus, the inteſtines, the anular muſcles, and the prickly beards: the tail on the other hand, is ſeen to ſhoot forth the noble organs, and, in leſs than three months, ſends forth a head, heart, together with all the apparatus and inſtruments of generation. Theſe parts, as may be eaſily ſuppoſed, were produced much ſlower than the former; a new head taking nearly three months for its completion; a new tail ſhooting forth in leſs than as many weeks. The lizard, and alſo the viper caſt their ſkin, and ſome ſay their tail, and even their eyes; and the ſea-ſlug is ſaid to caſt its head; all which are regenerated.

The buck caſts its horns every ſpring, which are reproduced in a few months. But if he be caſtrated when young, he will have no horns at all, or ſmall buds only, and thoſe ſoft to the touch, like velvet, and void of firmneſs. Dr. Ruſſel informs us, that he had two old bucks caſtrated at the end of February, and their horns dropped off, the twenty-firſt of March following; ſo that the fall of their horns was anticipated five

five weeks at leaſt. Theſe horns were renewed, next year, and were longer than the buck's of the ſame age; but the palms, or collateral branches, were leſs and ſhorter, and neither the velvet of the horns, nor the horns themſelves were ever caſt afterwards.

I ſhall now beg leave to lay before the Society, two caſes, that have not been publiſhed, in order to prove ſtill further the doctrine I have been endeavouring to eſtabliſh.

Roger Nuttal, of Bury, twenty years of age, was admitted an in-patient of the Mancheſter infirmary under my care, on the 23d of January, 1775, for a tumor on his back. Upon ſtripping off his ſhirt, to ſhew me the tumor, I was ſtruck with a very ſingular appearance of a ſtump of the right humerus. I aſked him, if he was born with it in that form, or whether his arm had been taken off. He informed me, that Mr. Kay Allen had taken his arm off cloſe to the ſhoulder, when he was but four years old, and that the ſtump was grown again to that length, which ſeemed to be about eight inches longer than he deſcribed it to have been, immediately after the amputation. I enquired both of his mother, and Mr. Allen, as to the truth of his relation, which they both confirmed; and the latter, with this addition, that the arm was taken off, as near the ſhoulder, as the application of the tournequet would permit. The bone had

every degree of firmneſs, and ſolidity, and the ſtump was warm to the extreme point, and he informed me, was perfectly ſenſible when touched. Along with this, you will receive a drawing of the young man, and the appearance which the ſtump made, executed by your ingenious Secretary Mr. Bew, at the time the patient was at the Infirmary.

Some years ago, I delivered a lady of rank of a fine boy, who had two thumbs upon one hand, or rather, a thumb double from the firſt joint, the outer one rather leſs than the other, each part having a perfect nail. When he was about three years old, I was deſired to take off the leſſer one, which I did; but to my great aſtoniſhment it grew again, and along with it, the nail. The family afterwards went to reſide in London, where his father ſhewed it to that excellent operator, William Bromfield, Eſq. ſurgeon to the Queen's houſehold, who ſaid, he ſuppoſed that Mr. White, being afraid of damaging the joint, had not taken it wholly out, but he would diſſect it out entirely, and then it would not return. He accordingly executed the plan, he had deſcribed, with great dexterity, and turned the ball fairly out of the ſocket; notwithſtanding this, it grew again, a freſh nail was formed, and the thumb remains in this ſtate.

The concluſions I would draw from theſe facts, are, that, in the human ſpecies, not only

fleſh,

fleſh, ſkin, and bones, may be regenerated, but membranes, ligaments, cartilages, glands, blood veſſels, and even nerves; and this for the wiſeſt purpoſes, that every part may be repaired in its own kind, and in ſome manner reſtored by the coagulable lymph, which is poured out, and becomes vaſcular, and forms organized parts.

By this wiſe proviſion of nature, the many accidents to which we are continually expoſed, are often more compleatly repaired, than art could be able to accompliſh.

In ſome animals, we ſee this regenerating and living principle, carried ſtill to a much greater length, where not only whole limbs, but even the more noble organs are reproduced.

The ſtudy of nature is not only engaging and pleaſant to a high degree, but it inſpires us with ſuch a reſpect and admiration of the Almighty Being, that it is impoſſible either for a Naturaliſt or an Anatomiſt to be an Atheiſt.

They have conſtantly before their eyes ſo many wonderful living machines, differently wrought, yet ſo compleatly faſhioned, and all tending to one great point, the preſervation of themſelves and their ſpecies; in which, there are ſo many orders of veſſels, one depending upon another, yet compleat in themſelves; capable of repairing injuries they may ſuſtain, and even of reſtoring loſt ſubſtances; that men, who daily ſee ſuch objects, muſt be con-

vinced, that theſe admirable fabrics cannot have proceeded from chance, but muſt have been the work of an Omnipotent Creator, who has formed them with the moſt perfect wiſdom, and attention to their ſeveral intereſts and ſituations;

> " And ſpite of pride, in erring reaſon's ſpite,
> " One truth is clear, Whatever is, is right."
>
> Pope's Eſſay on Man.

P. S. Mr. Parke, of Liverpool, in a Pamphlet he has lately publiſhed, intitled, "An account of a new Method of treating Diſeaſes of the Joints of the Knee and Elbow," has given us a caſe, which fell under the care of Mr. Wainman, of Skipton in Craven; and, as it is perhaps the fulleſt confirmation, that can poſſibly happen, of the regeneration, of not only the head of a bone, but of the capſular ligument, and ſynovial glands, and even every appendage of a joint, it may, perhaps, be thought to be a proper ſupplement to this paper. I ſhall therefore give the caſe in Mr. Wainman's own words. He deſcribes it, as "a violent luxation of the cubitus, occaſioned by a fall from a horſe in full ſpeed, which forced the os humeri, through the common integuments, a conſiderable length into the ground, and the bone was quite denudated." He adds, "There was not a poſſibility of reducing it, and I thought it moſt eligible to take off the limb, which

which the family objected to. I called in Dr. Taylor, who was of my opinion; but it would not be complied with. We then judged it beſt to ſaw off the os humeri, which I did, about an inch above the ſinus that receives the olecranon. I then placed the arm, in ſuch a poſition, as I thought would be moſt advantageous, prognoſticating, that an anchyloſis would enſue, in which I was miſtaken; the perſon is now living, and can perform all the motions of the joint, which is as flexible, as if nothing had ever been amiſs."

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## *An* ESSAY *on the* DIVERSIONS *of* HUNTING, SHOOTING, FISHING, *&c. conſidered as compatible with* HUMANITY. *Read January* 15, 1783.

WHILST the general conſtitution of ſociety remains, ſuch as that no man, however obſcure, can be conſidered as unconnected with the reſt of his ſpecies; whilſt, in every ſituation, our conduct and ſentiments, in ſome degree, invariably produce an influence on thoſe of others; no inquiry, which reſpects the genuine motive of ſuch actions, as are frequently com-

mitted, whether their object be, the pleasure of the individual, or the benefit of society, ought to be regarded as unworthy of serious attention.

The prevailing, though much to be lamented propensity of individuals, to justify their own failings, by the detection of similar weakness in superior characters, renders such an investigation the more necessary; and if, in the prosecution thereof, it should appear, that unworthy motives have been erroneously ascribed to some actions, which may be traced to a different source; or that from the peculiar constitution of human nature, some weaknesses are inseparable from kindred excellence; such discoveries would prove useful acquisitions to our fund of knowledge; they would tend to rectify the mistaken conceptions of the ignorant, or to improve the discriminating faculty in those, who are most easily seduced by the influence of example.

In reasoning concerning a species of animals, which we suppose, governed by a principle superior to that of instinct, it is desirable to trace a consistency between sentiments and actions, as on this alone, our claim to virtue and to reason seems founded. On a superficial survey, however, such a consistency appears but ill supported in the conduct of those, who, whilst they discharge all the moral duties, and in an especial manner, practise the virtues of hospitality, humanity, and benevolence, are yet

yet capable of diſcovering conſiderable pleaſure from thoſe amuſements, the profeſſed object of which is, to deprive of life an innocent animal, unacquainted with thoſe deſires which ſpring from luxury, and aſking no more of the bounties of our common Parent, than is neceſſary to its own ſupport and exiſtence.

To be prompted to ſuch actions, not from any neceſſity to gratify the wants of nature, but ſolely from the deſire of amuſement, appears, at firſt view, repugnant to every principle of humanity, and ſeems more characteriſtic of the ferocity of a ſavage, than of the clemency of a civilized being. What then ſhall we conclude! Are there no characters exempt from inconſiſtency? Or is virtue an empty name, without preciſe meaning? The mind ſhrinks with averſion from either concluſion. Let us therefore take a more intimate view of the motives to ſuch actions, and, perhaps, they may admit a ſolution, leſs repugnant to our feelings.

From the attributes juſtly aſcribed to the benevolent Author of our exiſtence, we may ſafely conclude, that every propenſity, with which the human mind is endowed, is not only neceſſary, but even conducive to our happineſs, whilſt indulged in a proper degree. This is not more true, of the mild and gentle diſpoſitions, thoſe which ſeem to be nouriſhed by the "milk of human kindneſs," than of our more

active and lively propenſities, thoſe which excite to the moſt vigorous and toilſome exertions.

The love of fame gives a glow, an enthuſiaſm, to the feelings of the poſſeſſor, when circumſcribed within proper limits, which leads him to combat fatigue and danger, to triumph over toil and difficulty, and ſmile amidſt the anguiſh of pain and death. Yet the ſame paſſion, uncontroled by reaſon, hath prompted the moſt abject ſubmiſſion, the moſt licentious exceſs; it hath produced the moſt baneful diſorders in ſociety, and, inſtead of deifying human nature, hath made earth the abode of thoſe ſpirits, which the poets have aſſigned to the confines of Tartarus.

We may remark the ſame, of every other diſpoſition of the human mind, in the exerciſe of which, the exceſs, or the deficiency alone is injurious; but there is none, the limited uſe whereof, doth not contribute to the happineſs of the individual, and the good of ſociety.

Not to wander, however, too far from our ſubject, let us, for a moment, conſider man in a ſtate of nature, whilſt he is yet unacquainted with the bleſſings which ſpring from civilization, or has conceived an idea of pleaſure, ſuperior to that which ariſes from the gratification of his appetites. His own perſonal ſafety, with that of thoſe who are dependent on his protection, joined to the daily cravings of nature, firſt dictate the neceſſity of waging war with many of thoſe animals,

animals, with whom he hath hitherto lived "joint tenant of the ſhade."

Perhaps theſe neceſſities, however, would not always be ſufficient to overcome that love of eaſe, which is ſo natural to a ſtate, wherein men ſeem only a ſmall degree elevated above the rank of brutes. Perhaps, if other inducements were not ſuperadded, he would not be ſtudious to plan, bold to reſolve, and active to engage in thoſe dangers and enterprizes, without which, he muſt frequently be deprived of this ſpecies of food, and obliged to ſubſtitute others, more eaſily gained, but leſs adapted to the health and vigour of the animal œconomy. Without inſiſting too much on theſe preſumptive reaſons, it is certainly a kind proviſion in the conſtitution of man, that thoſe exertions, which are dictated by neceſſity, ſhould alſo be inſpired by inclination; and that, whilſt his employment is made ſubſervient to the means of his exiſtence, it ſhould alſo become a principal inſtrument of his pleaſures.

Theſe remarks, however, principally apply to the rude and ſavage ſtate of man, which, happily for ſociety, is now almoſt unknown. There is no longer a neceſſity for an individual to be himſelf the executioner of the animal deſtined to his ſubſiſtence; yet, as hunting, ſhooting, angling, &c. are ſtill purſued, with as much avidity as formerly, it is neceſſary, if we propoſe

to

to juſtify theſe diverſions, to attempt it on principles, which apply to a ſtate, wherein men are humanized, by laws and government, and by the refining influence of arts, ſciences, and religion.

It will be generally allowed, that the health and vigour of the intellectual, as well as of the corporeal ſyſtem, require frequent exerciſe, and that their very exiſtence almoſt depends upon it. It is alſo pretty evident, that to induce ſuch a degree of exertion as will promote theſe ends, there muſt be ſomething to ſtimulate and incite; the final cauſe being too remote an object. Hence, every amuſement which exerciſes the powers and faculties of man, if not improperly expenſive, nor neceſſarily attended with a neglect of more noble and important purſuits, is, in this point of view, not only not cenſurable, but meritorious.

Such, however, is the conſtitution of man, that health alone will not ſatisfy his aſpirations after happineſs; and it is clear, that exerciſe is not more neceſſary to the perfection of his faculties, than to the promotion of his pleaſures. In the words of an elegant writer, equally diſtinguiſhed for depth of thought, and benevolence of character.* "Labour is the chief ingredient of the felicity to which man

* See the Stoic, Hume's Eſſays.

aſpires,

aſpires, and all his enjoyments ſoon become inſipid and diſtaſteful, when not acquired by fatigue and induſtry. See the hardy hunters riſe from their downy couches, ſhake off the ſlumbers which ſtill weigh down their heavy eye-lids, and ere Aurora has yet covered the earth with her flaming mantle, haſten to the foreſt. They have behind, in their own houſes, and in the neighbouring plains, animals of every kind, whoſe fleſh furniſhes the moſt delicious fare, and which offer themſelves to the fatal ſtroke. Laborious man diſdains ſo eaſy a purchaſe. He ſeeks for a prey, which hides itſelf from his ſearch, or flies from his purſuit, or defends itſelf from his violence. Having exerted in the chaſe, every paſſion of the mind, and every member of the body, he then finds the charms of repoſe, and with joy compares its pleaſures to thoſe of his engaging labours."

If exerciſe, then, be neceſſary to the health and well-being of man; if it be alſo neceſſary to thoſe pleaſures, for which nature hath inſpired him with the thirſt; and if hunting, ſhooting and fiſhing furniſh ſtimulating motives, which, in their abſence, it would not be eaſy to ſupply; theſe diverſions may be eſteemed both innocent and virtuous, whilſt conſidered ſolely with reſpect to the agent; and it remains only to examine, how far, to the united motives of pleaſure and advantage to man, other reaſons

may

may be added, in juſtification of actions, which reſpect the lives and happineſs of the brute creation.

Man, as lord of the creation, regards every other animal as intended for his neceſſary uſe, and ſubſervient to his reaſonable purpoſes. This prerogative ſeems to have been intended for him in the original conſtitution of things; and it is fully evident, that the proper exerciſe of it, is not more favourable to his own, than to the general good. Of ſome animals he prolongs the lives, and provides for the ſupport, to make them conducive to his own convenience. Others, doomed to contribute to his ſuſtenance, are cut off ere they attain maturity.* Even if it were not expedient to ſacrifice theſe to the indiſpenſible *wants* of man, *neceſſity* would equally prompt him to their deſtruction; ſince, if they were left uninterruptedly to provide for their own ſupport, and to propagate their ſpecies, their increaſe would ſoon be incompatible with his exiſtence, and probably, with that of their own.

It would, perhaps, be too haſty an aſſertion, to affirm, that death to brutes is no evil. We are not competent to determine, whether their exiſtence, like our own, may not extend to ſome

* In the laſt claſs may be enumerated moſt of the victims to the diverſions we ſpeak of.

future

future mode of being, or whether the preſent limited ſphere is all in which they are intereſted! On ſo ſpeculative a queſtion, little could be advanced with preciſion; nor is it neceſſary for the inveſtigation of the ſubject before us. If we may be allowed to reaſon only from what we know, it may ſafely be conjectured, that death to brutes is no poſitive evil; we have no reaſon to believe, they are indued with the gift of foreſight, and therefore, even admitting that with them the pleaſures of life exceed its pains and its cares, in terminating their exiſtence, they only ſuffer a privation of pleaſure.

Though the tie of natural affection is, perhaps, not leſs ſtrong in brutes, than in the human ſpecies, yet it is often neceſſarily diſſolved, and of much ſhorter continuance. It is alſo to be remembered, that, on the preſent plan of purſuing theſe diverſions, ſuch a regard is had to the circumſtances and ſituation of animals, that no helpleſs, feeble progeny is left to bewail the loſs of an affectionate parent; or, from the want of its providence and protection, to periſh from expoſure to rapacious animals, or the more cruel attacks of want and famine. The fate of an individual may, therefore, be conſidered as unconnected with that of any of its ſpecies; and if it be allowed, that an untimely period of its exiſtence is not to it any evil, the mode of its

ſuffering

ſuffering death, will not only be no objection to the diverſions we ſpeak of, but will furniſh reaſons of conſiderable weight in their favour.

The tie of natural affection, it hath already been obſerved, is not weak amongſt brute animals; but it may be remarked, that though in many caſes it is ſo ſtrong in parents towards their progeny, the reflected attachment ſeems to ſubſiſt, only whilſt the young offspring are incapable of providing for themſelves. When they attain to maturity, the connection is, in moſt caſes, diſſolved, and the relationſhip forgotten. How pitiable then muſt be the ſituation of that animal, whom age, with its attendants, weakneſs and diſeaſe, hath reduced to a feeble and helpleſs ſtate, incapable of providing for itſelf the neceſſary ſubſiſtence, a prey to continual apprehenſion from thoſe animals whoſe attacks it is unable to fly from or repel; and at length languiſhing to the period of its exiſtence, conſumed by famine and waſted by diſeaſe? Compare with the fate of ſuch an animal, that of the timid hare. She meets the opening morn in health and vigour, and with playful frolic wantons on yon upland hill, enlivened by the beams of the riſing ſun. No feeble pulſe, or languid eye, indicate a diſordered frame; no anticipation of her approaching fate inſpires her with apprehenſion. All is gay and lively, like the proſpect around her. On a ſudden, however, the ſcene is changed,

the

the echoing of the horn reſounds from the adjacent valley, and the cry of the deep-mouthed hounds thunders towards the hills. She becomes motionleſs with fear, when a ſecond alarm rouſes her from her trance; ſhe flies, and with eager ſteps ſeems to outſtrip the winds. Men, horſes, and dogs inſtantly join in the chace, and the foreſt echoes to the wild uproar. The hare doubles—the ſwiftneſs of her ſpeed abates—fear, more than fatigue, retards her flight—ſhe faints at the noiſe of the approaching hounds—redoubles to elude their purſuit—her feeble limbs are unable to perform their office—and now—breathleſs and exhauſted, ſhe is overtaken, and torn in pieces by her mercileſs purſuers.

Such a doom ſeems ſevere, and hard is the heart which doth not commiſerate the ſufferer. Its apparent ſeverity will, however, be much mitigated, if we conſider the quick tranſition, from perfect health to the expiring conflict. Death, brought on by diſeaſe, or the decay of nature, would be much more to be dreaded; and compared therewith, the fate of the partridge from the gun of the fowler, or of the trout by the rod of the angler, is mild and enviable.

To recapitulate then what hath been advanced on this ſubject—We have ſeen the human mind, in every age, endowed with a ſtrong, natural inclination to theſe diverſions. In the ſavage ſtate, we have ſeen, that the ſituation of man renders

renders ſuch a propenſity abſolutely neceſſary; we have ſeen it become, at once conducive to his convenience, and his pleaſures; we behold him emerge, from a ſtate of uncivilization, into poliſhed life. This propenſity ſtill accompanies him; it ſtimulates him to exerciſe the efficient cauſe of health; it inſpires him with a love of induſtry and activity, the certain ſource of true pleaſure; he becomes habituated to fatigue and exertion, deſpiſes danger and difficulty, nor dreads expoſure to thoſe elements, from whoſe ſeverity he acquires ſtrength of body, with vigor and firmneſs of mind. We have ſeen, with reſpect to brute animals, that, being deſtined for the uſe of man, in depriving them of exiſtence, he diſturbs not the order and intention of nature; that, in ſacrificing them to his pleaſures, he neither deſtroys nor diminiſhes their portion of enjoyment; and that, in exerciſing the prerogative with which he is inveſted, if he were not thus prompted by inclination, he would be compelled by neceſſity.

It may be urged, if not as an argument in favour of theſe diverſions, yet as a circumſtance which ſhould incline us to caution in condemning them, that they are purſued by many individuals, who are diſtinguiſhed for thoſe virtues of the heart; which ſeem totally inconſiſtent with thoughtleſs or with intentional cruelty; and which

which are at once the ornament and the bleſſings of ſociety.

The Patriot, or the Citizen, who, anxious for the good of his country, and of mankind, bends all his thoughts and all his faculties to the promotion of the public weal; who ſacrifices the comforts of eaſe and of repoſe, foregoes the ſweets of domeſtic bliſs, nor is with-held by the charms of ſocial converſe, when his exertions can tend to relieve the unfortunate from the burden of affliction, and to enliven the face of ſorrow with ſmiles of joy; will yet, when leiſure, from theſe more noble occupations permits, join in the pleaſures of the chaſe—arreſt the pheaſant in his aërial flight—or enſnare the inhabitants of the dimpled lake. And ſurely the heart, that makes "all human weal and woe its own," cannot rejoice in acts of inhumanity—Surely the generous paſſions of philanthrophy and benevolence, can never inſpire or accompany a cruel deed!

It would exceed the limits of this Eſſay, to take a comprehenſive view of the human mind, which yet is not unneceſſary in the inveſtigation of this ſubject. It might then, perhaps, appear, that amidſt all the variety and eccentricity, which the contemplation of a given character preſents, the primary diſpoſitions, the original motives, and ſprings of action, are extremely few. If

this were proved, the ſeeming inconſiſtency between many of the actions of an individual muſt diſappear; as it would be unfair to reaſon from any partial view of his character.

Perhaps the diſpoſitions, which incline us to theſe diverſions, are the ſame which, under other circumſtances, incite to the moſt heroic actions. The courage gained in the field, may be exerted to reſtrain the inſolence or ambition of a tyrant; expoſure to fatigue, and the inclemency of ſeaſons, qualify us for thoſe exertions which our ſtations, as members of ſociety may demand; and he who, fearleſs of danger, is emulous of diſtinction in the chaſe, may equally pant for glory, when the invaſion of his country prompts him to repel her foes.

We may further obſerve, that if Nature, with a liberal, but not laviſh hand, hath beſtowed on all her offspring, thoſe powers and propenſities only, which their own neceſſities, or the general order and œconomy of the ſyſtem require, we ſhall be unable to diſcover her intention in the gifts of ſcent to the hound, ſwiftneſs to the grey-hound, and ſagacity to the pointer; theſe being amongſt the number of innate inſtinctive faculties, which can only be exerciſed in ſome of the diverſions we ſpeak of, and for which purpoſes, we may therefore reaſonably preſume they were given.

Upon

Upon the whole, may we not then conclude, that man, by co-operating with ſuch animals, employs both his and their faculties on the purpoſes for which they were partially deſigned: thus tending to complete the bounteous ſcheme of Providence; the happineſs and well-being of all its creatures?

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## Observations *on* Longevity. *By* Anthony Fothergill, M. D. F. R. S. *Communicated in a Letter to Dr. Percival. Read January* 15, 1783.

DEAR SIR,

I HAVE often thought, it would be an uſeful undertaking to collect into one point of view, the memorable inſtances of long-lived perſons, whoſe ages are recorded by monumental inſcriptions, biographical writings, or even by the public prints. The only judicious attempt I have yet ſeen of this kind, was by the ingenious Mr. *Whitehurſt*, a few years ago, in his Inquiry into the Origin and Formation of the Earth. To the examples of longevity mentioned by him, as collected by a perſon of veracity from the

above ſources, I have now added ſundry remarkable inſtances of a ſimilar kind, as they have occurred to me in the courſe of reading; and have annexed the authorities, (ſo far as was practicable) that you may be enabled to judge of the degree of credibility, that may ſeem due to the reſpective facts, and of the allowance which it may appear neceſſary to make, for that natural propenſity, which mankind have ever betrayed for the marvellous. Now, admitting that many of the ages may have been ſomewhat exaggerated, yet ſtill there can be no poſſible doubt, that even theſe have extended far beyond the ordinary period of life, and may therefore be entitled to a place in the following tables, which I ſubmit to your conſideration, as a ſmall ſpecimen of what might be more worthy your attention, if conducted hereafter on a larger ſcale, and purſued with chronological accuracy.

TABLE

# TABLE I.

## OF LONGEVITY.

| Names of the Perſons. | Ages | Places of Abode. | Living or Dead. |
|---|---|---|---|
| Thomas Parre | 152 | Shropſhire | Died Nov. 16, 1635 Phil Tranſ No. 44. |
| Henry Jenkins | 169 | Yorkſhire | Died Dec. 8, 1670 Phil. Tranſ. No. 221 |
| Robert Montgomery | 126 | Ditto | Died in - 1670. |
| James Sands | 140 | Staffordſhire | } Do. Fuller's Worthies, p. 47. |
| His Wife | 120 | Ditto | |
| Counteſs of Deſmond | 140 | Ireland | Rawleigh's Hiſt. p. 166. |
| - - - - - - - Eccleſton | 143 | Ditto | Died - - 1601 (a) |
| J. Sagar | 112 | Lancaſhire | - - - 1668 (b) |
| - - Laurence | 140 | Scotland | Living - - (c) |
| Simon Sack | 141 | Triconia | Died May 30, 1764 |
| Col. Thomas Winſlow | 146 | Ireland | —— Aug. 26, 1766 |
| Francis Conſiſt | 150 | Yorkſhire | —— Jan. - 1768 |
| Chriſt. J. Drakenberg | 146 | Norway | —— June 24, 1770 (d) |
| Margaret Forſter | 136 | Cumberland | } Both living 1771 |
| - - - - - - her Daughter | 104 | Ditto | |
| Francis Bons | 121 | France | Died Feb. 6, 1760 |
| John Brookey | 134 | Devonſhire | Living - - 1777 (e) |
| James Bowels | 152 | Killingworth | Died Aug. 15, 1656 (f) |
| John Tice | 125 | Worceſterſhire | —— March 1774 (g) |
| John Mount | 136 | Scotland | —— Feb. 27, 1776 (h) |
| A. Goldſmith | 140 | France | —— June 1776 (i) |
| Mary Yates | 128 | Shropſhire | - - - 1776 (k) |
| John Bales | 126 | Northampton | —— April 5, 1706 (l) |
| William Ellis | 130 | Liverpool | —— Aug. 16, 1780 (m) |
| Louiſa Truxo, a Negreſs in S. America | 175 | Tucuman, S. America | Living Oct. 5, 1780 (n) |
| Margaret Patten | 138 | Lockneugh near Paiſley | Lynche's Guide to Health |
| Janet Taylor | 108 | Fintray, Scotland | Died Oct. 10, 1780 |
| Richard Lloyd | 133 | Montgomery | Lynche's Guide to Health |
| Suſannah Hilliar | 100 | Piddington, Northamptonſhire | Died Feb. 19, 1781 (o) |
| James Hayley | 112 | Middlewich, Cheſhire | —— March 17, 1781 (p) |
| Ann Cockbolt | 105 | Stoke-Bruerne, Northamptonſhire | —— April 5, 1775 (q) |

William Walker, aged 112, not mentioned above, who was a Soldier at the Battle of Edge-Hill.

(a) *Fuller*'s Worthies, p. 140
(b) Phil. Tranſ. abridged by Lowthorp, vol. III. p. 306.
(c) *Derham*'s Phyſico-Theology, p. 173.
(d) Annual Regiſter.
(e) Daily Advertiſer, Nov. 18, 1777.
(f) Warwickſhire.
(g) Daily Advertiſer, March 1774.
(h) Morning Poſt, Feb. 29, 1776.
(i) Daily Advertiſer, June 24, 1776.
(k) Ibidem, Aug. 22, 1776,
(l) See Inſcription in the Portico of All-Saints Church.
(m) London Even. Poſt, Aug. 22, 1780.
(n) London Chronicle, Oct. 5, 1780.
(o) North. Mercury, Feb. 19, 1781.
(p) Gen. Even. Poſt, March 24, 1781.
(q) Well known to Perſons of Credit at Northampton.

If we look back to an early period of the chriſtian æra, we ſhall find that *Italy* has been, at leaſt about that time peculiarly propitious to longevity. Lord *Bacon* obſerves, that the year of our Lord 76, in the reign of *Veſpaſian*, was memorable; for in that year was a taxing, which afforded the moſt authentic method of knowing the ages of men. From it, there were found in that part of *Italy*, lying between the *Appenine* mountains, and the river *Po*, one hundred and twenty four perſons who either equalled, or exceeded one hundred years of age, namely:

TABLE II.

| | | | | | |
|---|---|---|---|---|---|
| | 54 | Perſons | of | 100 | Years each. |
| | 57 | - - | of | 110 | |
| | 2 | - - | of | 125 | |
| | 4 | - - | of | 130 | |
| | 4 | - - | of | 136 | |
| | 3 | - - | of | 140 | |
| In *Parma* | 3 | - - | of | 120 | Years each. |
| | 2 | - - | of | 130 | |
| In *Bruſſels* | 1 | - - | of | 125 | |
| In *Placentia* | 1 | - - | of | 131 | |
| In *Faventia* | 1 | - - | of | 132 | |
| | 6 | - - | of | 110 | |
| | 4 | - - | of | 120 | |
| In *Rimino* | 1 | - - | of | 150 | Years, viz. Marcus Aponius. |

Mr.

Mr. *Carew*, in his ſurvey of *Cornwall*, aſſures us, that it is no unuſual thing, with the inhabitants of that county, to reach ninety years of age and upwards, and even to retain their ſtrength of body, and perfect uſe of their ſenſes. Beſides *Brown*, the Corniſh beggar, who lived to one hundred and twenty, and one *Polezew* to one hundred and thirty years of age, he remembered the deceaſe of four perſons in his own pariſh, the ſum of whoſe years, taken collectively, amounted to three hundred and forty. Now, although longevity evidently prevails more in certain diſtricts than in others, yet it is, by no means, confined to any particular nation or climate; nor are there wanting inſtances of it, in almoſt every quarter of the globe, as appears from the preceding, as well as the ſubſequent table.

## TABLE III.

## OF LONGEVITY.

| Names of the Perſons. | Age. | Places of Abode. | Where recorded. |
|---|---|---|---|
| Hippocrates, Phyſician, | 104 | Iſland of Cos | Lynche on Health, Chap. 3. |
| Democritus, Philoſopher | 109 | Abdera | Bacon's Hiſtory, 1095. |
| Galen, Phyſician | 140 | Pergamus | Voſſ. Inſt. or Lib. 3. |
| Albuna Marc | 150 | Ethiopia | Hakewell's ap. Lib. 1. |
| Dumitur Raduly | 140 | Haromſzeck Tranſilvania | Died Jan. 18, 1782. Gen. Gazetteer, April 18th. |
| Titus Fullonius | 150 | Bononia | Fulgoſus, Lib. 8. |
| Abraham Paiba | 142 | Charles-town, South Carolina | General Gazetteer. |
| L. Tertulla | 137 | Arminium | Fulgoſus, Lib. 8. |
| Lewis Coronaro | 100 | Venice | Bacon's Hiſt. of Life, &c. p. 134. |
| Robert Blakeney, Eſq. | 114 | Armagh, Ireland | General Gazetteer. |
| Margaret Scott | 125 | Dalkeith, Scotland | See Inſcrip. on her Tomb in Dalkeith Ch. Yard. |
| W. Gulſtone | 140 | Ireland | Fuller's Worthies. |
| J. Bright | 105 | Ludlow | Lynche on Health. |
| William Poſtell | 120 | France | Bacon's Hiſt. p 134. |
| Jane Reeves | 103 | Eſſex | St. J. Chron. June 14, 1781. |
| W. Paulet, Marquis of Wincheſter | 106 | Hampſhire | Baker's Chron. p. 502. |
| John Wilſon | 116 | Suffolk | Gen. Gaz Oct. 29, 1782. |
| Patrick Wian | 115 | Leſbury, Northumberland | Plempius Fundammed. Sect. 4, Chap. 8. |
| M. Laurence | 140 | Orcades | Buchanan's Hiſt. of Scot. |
| Evan Williams | 145 | Carmarthen Work houſe, ſtill alive | Gen. Gazetteer, Oct. 12, 1782. |

The Antidiluvians are purpoſely omitted, as bearing too little reference to the preſent race of mortals, to afford any ſatisfactory concluſions; and the improbable ſtories of ſome perſons, who have almoſt rivalled them in modern times, border too much upon the marvellous, to find a place in theſe tables. The preſent examples are abundantly ſufficient to prove, that longevity does not depend ſo much, as has been ſuppoſed,

on

on any particular climate, ſituation, or occupation in life. For we ſee, that it often prevails in places, where all theſe are extremely diſſimilar; and it would, moreover, be very difficult, in the hiſtories of the ſeveral perſons above-mentioned, to find any circumſtance common to them all, except, perhaps that of being born of healthy parents, and of being inured to daily labour, temperance, and ſimplicity of diet. Among the inferior ranks of mankind, therefore, rather than amongſt the ſons of eaſe and luxury, ſhall we find the moſt numerous inſtances of longevity; even frequently, when other external circumſtances ſeem extremely unfavourable: as in the caſe of the poor ſexton at *Peterborough*, who, notwithſtanding his unpromiſing occupation among dead bodies, lived long enough to bury two crowned heads, and to ſurvive two complete generations.* The livelihood of *Henry Jenkins*, and old *Parr*, is ſaid to have conſiſted chiefly of the coarſeſt fare, as they depended on precarious alms. To which may be added, the remarkable inſtance of *Agnes Milburne*, who, after bringing forth a numerous offspring, and being obliged, through extreme indigence, to paſs the latter part of her life in St. Luke's work-houſe, yet reached her

* *Fuller*'s Worthies, p. 293, from a Memorial in the Cathedral at *Peterborough*.

hundredth

hundredth and ſixth year, in that ſordid, unfriendly ſituation.* The plain diet, and invigorating employments of a country life, are acknowledged, on all hands, to be highly conducive to health and longevity, while the luxury and refinements of large cities are allowed to be equally deſtructive to the human ſpecies: and this conſideration alone, perhaps, more than counterbalances all the boaſted privileges, of ſuperior elegance and civilization, reſulting from a city life.

From country villages, and not from crouded cities, have the preceding inſtances of longevity been chiefly ſupplied. Accordingly it appears, from the London bills of Mortality, during a period of thirty years, viz. from the year 1728 to 1758, the ſum of the deaths amounted to 750,322, and that, in all this prodigious number, only two hundred and forty two perſons ſurvived the hundredth year of their age! This overgrown metropolis is computed, by my learned friend Dr. *Price*, to contain a ninth part of the inhabitants of England, and to conſume annually, ſeven thouſand perſons, who remove into it from the country every year, without increaſing it. He moreover obſerves, that the number of inhabitants, in England and Wales, has diminiſhed about one fourth part ſince the revolution, and ſo rapidly of late, that,

* *Lynche*'s Guide to Health, C. III.

in

in eleven years, near 200,000 of our common people have been loſt!* If the calculation be juſt, however alarming it may appear in a national view, there is this conſolation, when conſidered in a philoſophical light, that without partial evil, there can be no general good; and that, what a nation loſes in the ſcale of population at one period, it gains at another; and thus, probably, the average number of inhabitants, on the ſurface of the globe, continues, at all times, nearly the ſame. By this medium, the world is neither overſtocked with inhabitants, nor kept too thin, but life and death keep a tolerably equal pace. The inhabitants of this iſland, comparatively ſpeaking, are but as the duſt of the balance; yet, inſtead of being diminiſhed, we are aſſured by other writers, that, within theſe thirty years, they are greatly increaſed. †

The deſire of ſelf-preſervation, and of protracting the ſhort ſpan of life, is ſo intimately interwoven with our conſtitution, that it is juſtly eſteemed one of the firſt principles of our nature, and, in ſpite even of pain and miſery, ſeldom quits us to the laſt moments of our exiſtence. It ſeems, therefore, to be no leſs our duty, than our intereſt, to examine minutely

* Obſervations on Population, &c. p. 305.

† The Rev. Mr. *Howlet*, Mr. *Wales*, and others.

into

into the various means, that have been conſidered as conducive to health and long life; and, if poſſible, to diſtinguiſh ſuch circumſtances as are eſſential to that great end, from thoſe which are merely accidental. But here, it is much to be regretted, that an accurate hiſtory of the lives of all the remarkable perſons, in the above table, ſo far as relates to the diet, regimen, and the uſe of the *non-naturals*, has not been faithfully handed down to us; without which, it is impoſſible to draw the neceſſary inferences. Is it not then a matter of aſtoniſhment, that hiſtorians and philoſophers have hitherto paid ſo little attention to longevity? If the preſent imperfect liſt ſhould excite others, of more leiſure and better abilities, to undertake a full inveſtigation of ſo intereſting a ſubject, the enquiry might prove not only curious, but highly uſeful to mankind. In order to furniſh materials for a future hiſtory of longevity, the bills of mortality, throughout the kingdom, ought firſt to be reviſed, and put on a better footing; agreeably to the ſcheme which you pointed out ſome time ago, and of which Mancheſter and Cheſter, have already given a ſpecimen, highly worthy of imitation. The plan, however, might be further improved, with very little trouble, by adding a particular account of the diet and regimen of every perſon, who dies at eighty years of age, or upwards; and mentioning,

ing, whether his parents were healthy, long-lived people, &c. &c. An accurate regiſter, thus eſtabliſhed throughout the *Britiſh* dominions, would be productive of many important advantages to ſociety, not only in a medical, and philoſophical, but alſo in a political and moral view. It is therefore to be hoped, that the legiſlature will not long delay taking an object, of ſuch great utility, into their ſerious conſideration.

All the circumſtances, that are moſt eſſentially neceſſary to life, may be comprized under the ſix following heads.

1. Air and climate.
2. Meat and drink.
3. Motion and reſt.
4. The ſecretions and excretions.
5. Sleep and watching.
6. Affections of the mind.

Theſe, though all perfectly natural to the conſtitution, have by writers, been ſtyled the *non-naturals*, by a ſtrange perverſion of language; and have been all copiouſly handled under that improper term. However, it may not be amiſs, to offer a few ſhort obſervations on each, as they are ſo immediately connected with the preſent ſubject.

1. Air, &c. It has long been known, that freſh air is more immediately neceſſary to life than food; for a man may live two or three days without the latter, but not many minutes without the former. The vivifying principle contained

contained in the atmoſphere, ſo eſſential to the ſupport of flame, as well as animal life, concerning which, authors have propoſed ſo many conjectures, appears now to be nothing elſe but that pure dephlogiſticated fluid lately diſcovered by that ingenious philoſopher, Dr. *Prieſtley*. The common atmoſphere may well be ſuppoſed to be more or leſs healthy in proportion, as it abounds with this animating principle. As this exhales, in copious ſtreams, from the green leaves of all kinds of vegetables, even from thoſe of the moſt poiſonous kind, may we not, in ſome meaſure, account why inſtances of longevity are ſo much more frequent in the country, than in great cities; where the air, inſtead of partaking ſo largely of this ſalutary impregnation, is daily contaminated with noxious animal effluvia, and phlogiſton?

With reſpect to climate, various obſervations conſpire to prove, that thoſe regions, which lie within the temperate zones, are beſt calculated to promote long life. Hence, perhaps, may be explained, why *Italy* has produced ſo many long livers, and why Iſlands in general are more ſalutary than Continents; of which *Bermudas*, and ſome others, afford examples. And it is a pleaſing circumſtance, that our own Iſland, appears from the above table, (notwithſtanding the ſudden viciſſitudes to which it is liable,) to contain far more inſtances

of

of longevity than could well be imagined. The ingenious Mr. *Whitehurſt*, aſſures us, from certain facts, that Engliſhmen are, in general, longer lived than North Americans; and, that a Britiſh conſtitution will laſt longer, even in that climate, than a native one.* But it muſt be allowed in general, that the human conſtitution is adapted to the peculiar ſtate, and temperature, of each reſpective climate, ſo that no part of the habitable globe can be pronounced too hot, or too cold, for its inhabitants. Yet, in order to promote a friendly intercourſe between the moſt remote regions, the Author of Nature has wiſely enabled the inhabitants to endure great and ſuprizing changes of temperature with impunity.†

2. Foods and drink. Though foods and drink, of the moſt ſimple kinds, are allowed to be the beſt calculated for ſupporting the body in health, yet it can hardly be doubted, but variety may be ſafely indulged occaſionally, provided men would reſtrain their appetites within the bounds of temperance. For bountiful nature cannot be ſuppoſed to have poured forth ſuch a rich profuſion of proviſions, merely

* Enquiry into the Original State, and Formation of the Earth.

† See remarkable inſtances of this, in the Account of Experiments in a heated room, by Dr. *George Fordyce*, and others.

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to

to tantalize the human ſpecies, without attributing to her the part of a cruel ſtep-dame, inſtead of that of the kind and indulgent parent. Beſides, we find, that by the wonderful powers of the digeſtive organs, a variety of animal and vegetable ſubſtances, of very diſcordant principles, are happily aſſimilated into one bland homogeneous chyle; therefore, it ſeems natural to diſtruſt thoſe cynical writers, who would rigidly confine mankind to one ſimple diſh, and their drink to the mere water of the brook. Nature, it is true, has pointed out that mild, inſipid fluid, as the univerſal diluent; and, therefore, moſt admirably adapted for our daily beverage. But experience has equally proved, that vinous, and ſpiritous liquors, on certain occaſions, are no leſs ſalutary and beneficial, whether it be to ſupport ſtrength againſt ſickneſs, or bodily fatigue, or to exhilerate the mind under the preſſure of heavy misfortunes. But alas! what Nature meant for innocent and uſeful cordials, to be uſed only occaſionally, and according to the direction of reaſon; cuſtom and caprice, have, by degrees, rendered habitual to the human frame, and liable to the moſt enormous and deſtructive abuſes? Hence, it may be juſtly doubted, whether gluttony and intemperance, have not depopulated the world, more than even ſword, peſtilence, and famine. True, therefore, is the old maxim, "Modus utendi

utendi ex veneno facit Medicamentum, ex Medicamento, venenum."

3. and 4. Motion and reſt, ſleep and watching. It is allowed on all hands, that alternate motion and reſt, and ſleep and watching, are neceſſary conditions to health and longevity; and that they ought to be adapted to age, temperament, conſtitution, temperature of the climate, &c. but the errors which mankind daily commit, in theſe reſpects, become a fruitful ſource of diſeaſes. While ſome are bloated and relaxed with eaſe and indolence, others are emaciated, and become rigid, through hard labour, watching, and fatigue.

5. Secretions and execretions. Where the animal functions are duly performed, the ſecretions go on regularly; and the different evacuations ſo exactly correſpond to the quantity of aliment taken in, in a given time, that the body is found to return daily to nearly the ſame weight. If any particular evacuation happen to be preternaturally diminiſhed, ſome other evacuation is proportionally augmented, and the equilibrium is commonly preſerved; but continued irregularities, in theſe important functions, cannot but terminate in diſeaſe.

6. Affections of the mind. The due regulation of the paſſions, perhaps, contributes more to health and longevity, than that of any

other of the *non-naturals*. The animating paſſions, ſuch as joy, hope, love, &c. when kept within proper bounds, gently excite the nervous influence, promote an equable circulation, and are highly conducive to health; while the depreſſing affections, ſuch as fear, grief, and deſpair, produce the contrary effect, and lay the foundation of the moſt formidable diſeaſes.

From the light which hiſtory affords us, as well as from ſome inſtances in the above table, there is great reaſon to believe, that longevity is, in a great meaſure, hereditary; and that healthy, long-lived parents would commonly tranſmit the ſame to their children, were it not for the frequent errors in the *non-naturals*, which ſo evidently tend to the abbreviation of human life.

Whence is it, but from theſe cauſes, and the unnatural modes of living, that, of all the children which are born in the capital cities of *Europe*, nearly one half die in early infancy? To what elſe can we attribute this extraordinary mortality? Such an amazing proportion of premature deaths is a circumſtance unheard of, among ſavage nations, or among the young of other animals! In the earlieſt ages, we are informed, that human life was protracted to a very extraordinary length; yet how few perſons, in theſe later times, arrive at that period, which nature

nature ſeems to have deſigned! Man is, by nature, a field-animal, and ſeems deſtined to riſe with the ſun, and to ſpend a large portion of his time in the open air, to inure his body to robuſt exerciſes, and the inclemency of the ſeaſons, and to make a plain homely repaſt, only when hunger dictates. But art has ſtudiouſly defeated the kind intentions of nature; and by enſlaving him to all the blandiſhments of ſenſe, has left him, alas! an eaſy victim to folly and caprice! To enumerate the various abuſes, which take place from the earlieſt infancy, and which are continued through the ſucceeding ſtages of modiſh life, would carry me far beyond my preſent intention. Suffice it to obſerve, that they prevail more particularly among people, who are the moſt highly poliſhed and refined. To compare their artificial mode of life, with that of nature, or even with the long livers in the liſt, would, probably, afford a very ſtriking contraſt; and, at the ſame time, ſupply an additional reaſon, why, in very large cities, inſtances of longevity are ſo very rare. Of late years, the increaſing luxury and diſſipation of the age, no longer confined to the metropolis, have ſpread their contagion far and wide into the country, ſo as to afford the ſage divine, and ſpeculative moraliſt, a more melancholy proſpect of the apparent degeneracy

of the human race, than, perhaps, was ever before exhibited!*

That ſo complicated a machine, as the human body, ſo delicate in its texture, and ſo exquiſitely formed in all its parts, ſhould continue, for ſo many years to perform its various functions, even under the moſt prudent conduct, is not a little ſurpriſing: but that it ſhould ever hold out to any advanced period, under all the rude ſhocks it ſo often meets with from riot and intemperance, which lay it open to all the various "ills that fleſh is heir to," is ſtill more truly miraculous! But here, perhaps, it may be alledged, that it never can be ſuppoſed, all the long livers purſued one uniform, regular courſe of life, ſince it is well known, that ſome of the moſt noted ones were ſometimes guilty of great deviations from ſtrict temperance and regularity. Let not this, however, encourage the giddy libertines, of the preſent age, to hope to render their continued ſcenes of intemperance

* I ſay *apparently*, becauſe mankind, in reality, have been equally prone to vice and folly in all ages; only theſe have aſſumed different appearances, according to the taſte and manners of the times: not that the human heart has been ſucceſſively growing more and more depraved, as the Poet ſatyrically exclaims,

> Ætas parentum, pejor avis, tulit
> Nos nequiores; mox daturos
> Progeniem vitioſiorem! *Hor.* Lib. III. Ode 6.

and

and debauchery, compatible with health and longevity. The duties and occupations of life, will not, indeed, permit the generality of mankind to live by rule, and ſubject themſelves to a preciſe regimen. Fortunately, this is not neceſſary: for, the divine Architect, has, with infinite wiſdom, rendered the human frame ſo ductile, as to admit of a very conſiderable *latitude of health*; yet this has its bounds, which none can long tranſgreſs with impunity. For, if old *Parr*, notwithſtanding ſome exceſſes, and irregularities, arrived at ſo aſtoniſhing an age, yet we have reaſon to ſuppoſe, that theſe were far from being habitual; and may alſo conclude, that had it not been for theſe abuſes, his life might have been ſtill conſiderably protracted.

On the whole, though ſome few exceptions may occur, to what has been already advanced, yet, it will be found, in general, that all extremes are unfriendly to health and longevity. Exceſſive heat enervates the body; extreme cold renders it torpid: ſloth and inactivity clog the neceſſary movements of the machine; inceſſant labour ſoon wears it out. On the other hand, a temperate climate, moderate exerciſe, pure country air, and ſtrict temperance, together with a prudent regulation of the paſſions, will prove the moſt efficacious means of protracting life to its utmoſt limits. Now, if any of theſe

require more peculiar attention than the reſt, it is, undoubtedly, the laſt: for the ſocial paſſions, like gentle gales, fan the brittle veſſel calmly along the ocean of life, while, on the other hand, rough, turbulent ones daſh it upon rocks and quickſands. Hence, perhaps, it may be explained, why the cultivation of philoſophy, muſic, and the fine arts, all which manifeſtly tend to humanize the ſoul, and to calm the rougher paſſions, are ſo highly conducive to longevity. And, finally, why there is no ſure method of ſecuring that habitual calmneſs and ſerenity of mind, which conſtitute true happineſs, and which are, at the ſame time, ſo eſſential to health and long life, without virtue.

"*Æquanimitas ſola, atque unica felicitas.*"

I hope you will excuſe the prolixity of this letter, and believe me to be, with the higheſt eſteem,

Dear Sir,

Your ſincere Friend

and faithful humble Servant,

A. FOTHERGILL.

London, *Nov.* 23, 1782.

*On*

## *On the* INFLUENCE *of the* IMAGINATION, *and the* PASSIONS, *upon the* UNDERSTANDING. *By the Rev.* THOMAS BARNES, D. D. *Read Feb.* 12, 1783.

A SENTIMENT was advanced in converſation ſeveral evenings ago, in this place, which, to ſome Gentlemen, appeared ſtrange, or rather, *falſe*. The reſpect I owe to this Society and above all, to Truth, obliges me to endeavour to defend a point, which appears to me, to be, not only juſt, but very important.

In the converſation before alluded to, it had been aſſerted, "That an energy, imparted to "*one* power of the human mind, will often com-"municate a degree of energy to the *reſt*, and "thus aſſiſt and quicken *their* operation."

In proof of this, it was maintained, "That "in many caſes, the vigour of IMAGINATION will "give correſpondent vigour to the JUDGMENT," and "That a degree of warmth and SENSIBILITY, "will be greatly favourable to the *clearneſs*, as "well as to the *celerity*, of the perceptions of the "UNDERSTANDING."

This ſentiment will, probably, alarm thoſe who have implicitly received what is ſo generally aſſerted, "That pure and ſimple truth has nothing

" to do with imagination, feelings, or paſſions;
" and, that he will bid the faireſt for ſucceſsful
" inquiry into any ſubject, who can diveſt his
" mind moſt entirely of all *affections*, and bring
" it into a ſtate of abſolute *indifference*, and
" *apathy*."

It is not uncommon, to hear the Imagination condemned as a criminal of the moſt dangerous nature, whoſe province is, at the beſt, only to amuſe, who is a ſworn enemy to truth, and whom Reaſon wiſhes to baniſh as far as poſſible from her throne. How often have we known, what was *very dull*, for want of ſome ſeaſonings of imagination, ſuppoſed to be, for that reaſon, *very deep?* Whilſt, on the other hand, what was enlivened by the animation of an active fancy, was cenſured, as flimſy, and irrational? As if a brilliant imagination could not poſſibly become the companion, and aſſiſtant of the pureſt underſtanding!—That it *may*, is the point which this paper attempts to prove.

In ſupporting this hypotheſis, I beg leave to hazard a deſcription of the human mind, which ſome may not very readily admit. In judging of the mental powers, it does not appear to me philoſophically juſt, to deſcribe the ſoul, as conſiſting of ſeveral diſtinct and diſcordant faculties, of which, ſome are commiſſioned perpetually to oppoſe and contradict the others. The proper idea of human nature

ſeems

ſeems to be, "That it is ONE UNCOMPOUNDED "ESSENCE, continually in motion, and receiving "different denominations, according to the "different *modes* and circumſtances of its move-"ment." Inſtead of conſidering the under-ſtanding, memory, paſſions, and will, as *diſtinct* and *oppoſite powers*, or, as unconnected tenants under the ſame roof, would it not be more juſt, to conſider them all as *modes* of the MIND ITSELF, and as each of them bearing the common nature and character of the whole united ſpirit? We ſhould then conſider, the *mind itſelf* as under-ſtanding, the *mind itſelf* as judging, remembering, feeling, willing. And this idea would be exactly conſonant to many facts, and phenomena of human nature, which will be hereafter men-tioned.

However the common repreſentation of human nature, as conſiſting of *ſeveral contending* powers, may have been *figuratively* adopted, in order to ſolve ſome appearances, ſuch as, the experience of *conflicting paſſions*, or of *oppoſite tendencies* in the ſoul, yet, it is not founded in philoſophical truth, and, if not properly guarded, by being always conſidered merely *as a figure*, it may lead to falſehood, and abſurdity.

The full elucidation of all theſe poſitions, would ſwell this paper to a length, far beyond the limits wiſely appointed for our communi-cations, which, being intended only as a ſubſi-

diary

diary to converſation, ſhould rather contain *hints*, than a regular compoſition of finiſhed and artificial ſentences. I may add, this ſubject would have received its *beſt* illuſtrations and ſupport from MORALS, and RELIGION. But, as theſe would lead me too much into a profeſſional line, I ſhall endeavour to draw the arguments from thoſe lower ſubjects, of TASTE, CRITICISM, and POLITE LITERATURE, by which it appears to me, to be unanſwerably ſupported.

The points we undertake to defend are theſe; "That the imagination and paſſions *may*, within "proper limits, be of the utmoſt ſervice in "giving ſtrength and clearneſs to the under-"ſtanding. And, that this ariſes,—from the "nature, and office of the imagination,—and "from the principle before-mentioned, that the "energy of *one* power may be communicated to "the *reſt*, with the greateſt advantage."

It is owing to the narrowneſs of our faculties, that we do not comprehend the *ſubſtance* of the human mind. Of its *operations*, however, we can ſpeak with certainty. I repreſent it to myſelf, as *one uniform and ſimple eſſence*, liable to be *moved* or *affected* by the various objects around it, or, by the flow of ideas continually paſſing before it—and, according to the ſtate and temperament of the *whole indiviſible maſs*, judging, feeling, willing, acting. Hence, it will follow, that it will judge, and feel, and act, not according

according to the impulſe of *ſome diſtinct and unconnected* faculty, but according to the ſtate and diſpoſition of the *whole mind.*

And, is it not true in *fact,* that men *do thus* judge, and feel, and act; not according to the movement of a ſingle power; but, according to the *general character* and complexion of the heart? The poet has beautifully illuſtrated and enforced this ſentiment.

------ "The difference is as great between
" The OPTICS ſeeing, as the OBJECTS ſeen.
" All manners take a tincture from our own;
" Or come diſcoloured, *through our paſſions* ſhewn.
" Or Fancy's beam enlarges, multiplies,
" Contracts, inverts, and gives ten thouſand dyes."

Pope.

Do not all Politicians judge upon every article of news, according to their prepoſſeſſions? Is it not of equal importance, in EDUCATION, to give a proper bias to the *heart,* as to furniſh proper ideas for the *head,* in order to produce *rectitude of mind?* Hence, the ſanctity of *error.* Hence, the different manner in which you judge of the ſame actions, in a *friend,* and in an *enemy.* Hence, all the advantages of *manner,* of *oratory,* of *addreſs.* And hence, all that faſcination of the *graces,* upon which, if a noble author has ſaid true, ſo much depends. In all theſe caſes, the underſtanding acts, not as a ſingle inſulated principle, but as taking its tinge and impreſſion, from

from the feelings, the imagination, and the heart.

This fact will probably not be conteſted. But it will be ſaid, "That theſe paſſions are the "ſources of all our errors, and that, if we could "entirely lay aſide imagination and affection, "we ſhould judge upon every ſubject, more "impartially, and therefore, more truly."

Allowing, that truth is ever one and the ſame, yet if, as the foregoing facts evince, the ſame truth will appear very differently to different minds, and to the *ſame* mind at *different* times; if the diſpoſition and frame of the mind be a kind of *medium*, through which the ſame object ſhall appear amazingly diverſified, moſt amiable to one, moſt diſguſting to another: Then, it ſhould ſeem to follow, that what is moſt deſirable to a right judgment, is, not, that the mind be diveſted of *all* its affections, that the imagination be laid aſleep, and that the underſtanding *alone* be employed in the contemplation. To me, all this appears to be, neither neceſſary, nor poſſible. But, that the *whole united mind*, conſidered as comprehending all its various powers, ſhall be in a *proper ſtate* for the inveſtigation and reception of truth, and, that the imagination and paſſions ſhall be of ſuch a temperament, as to aſſiſt the judgment in its determination. This is not a ſtate of abſolute inaction; but of action ſuited to their proper nature and office, in ſubordination

ſubordination to the higher powers of reaſoning and judgment.

If the underſtanding were that pure and ſimple principle, which many repreſent it to be, entirely diſtinct from all the paſſions, and able to judge *beſt* of every truth, when moſt ſeparate from their influence, we ſhould not, ſurely, obſerve ſo much diverſity of judgment, ſuch amazing variety of opinions, upon almoſt every ſubject of human life. Wherever it is *poſſible* for human affections, intereſts, or feelings to inſinuate themſelves, we find a *tinge* of their nature, in the judgment. If we ſuppoſe the *mind itſelf* to judge, according to *its nature and character*, we ſhall immediately perceive, that its ſentence *muſt* be coloured and diverſified—that the judgment will faſhion itſelf to the ſtate of the heart—and that, in almoſt every inſtance, a falſe *taſte* or *feeling*, will lead to falſe opinion, whether in poetry, painting, muſic, criticiſm, oratory, or art in general. Is there not an almoſt univerſal conformity between the feelings and the judgment? Even *vice itſelf*, in the paroxyſms of temptation, for a moment, ſeduces the underſtanding, and blinds the reaſon. At *that* moment, the ſinner promiſes himſelf impunity, and enjoyment. Nor is it, till the temptation is *paſt*, that the mind ſees *again* the deformity and danger of vicious conduct.

But,

But, it will be aſked, "Are not the *paſſions*, then, the *cauſes* of our wrong judgments?" Moſt certainly they *are*. But, upon the ſame principle, that *wrong* paſſions lead to wrong judgments, *right* paſſions would lead to true. If the mind were properly *affected*, it would *judge* properly.

But, let us inquire more particularly, into the nature and office of the *Imagination*—for theſe are, I perſuade myſelf, very commonly, and very greatly, miſtaken.

Imagination is that *power*, or more properly, that *act* of the mind, which aſſembles, compounds, divides its ideas, *not* in the order in which they firſt came into the mind, for *that* is the province of *memory*, but, in *any* order, and upon *any* principles it chooſes. It ranges abroad, through the immenſe magazine and repoſitory of ideas, treaſured up there, and joins together, or ſeparates, at pleaſure, ideas, qualities, and forms. It may be called, the *ſervant* or *labourer* of the mind, continually employed, to bring before it, from its amazing ſtorehouſe, *materials*, with which to build up its concluſions. It is the ever buſy, patient, indefatigable *drudge*, toiling for the common benefit and aſſiſtance of all the other powers; and does not *deſerve* the indignities and reproaches, it is continually receiving. How often is it forced to be *preſent*, and even to give *aſſiſtance*, in the condemnation and execution of *itſelf?* How many, with declamation moſt

moſt extravagant, with ideas moſt deranged, with apprehenſions moſt fanciful, have abuſed the poor imagination, whilſt all their cenſure and alarm have had no better, than an *imaginary* foundation ?*

A mind *too imaginative* does, indeed, often join its ideas together in wild and ridiculous aſſociations. One who is called, *a wit*, joins only thoſe which appear *odd* and fantaſtic. But he, whoſe *judging* are exactly poiſed by his *imaginative* powers, who is, according to our ſcheme, *at once*, lively to conceive, and ſober to judge, collects together only *thoſe* ideas, which are proper to ſet the ſubject before him in ſuch a light, as to enable him to form an exact determination. The power of *imagining*, is, therefore, in its place, as neceſſary, as the power of *judging*. Suppoſe a mind which could only *remember*—It would fall, at once, into the track marked out by *others*, and would never employ its *own* powers, by reaſoning and determining for itſelf. Accordingly we find, that perſons of the ſtrongeſt memory have generally the weakeſt judgments.

If theſe principles are juſt, a mind, which could not *imagine*, could not *reaſon*. It would have no *materials* before it, on which to form its deciſion, Its view of any ſubject would be narrow and defective. Obſerve, on the other

* - - - "turbida terret imago." Virgil. Æn. IV. 353.

hand,

hand, a mind, keen and fervent in the profecution of a favourite ſubject, viewing it attentively on every ſide, catching every ray of light, which can illuminate, and every kindred ſentiment, which can illuſtrate it. Without animation and ardour, *theſe* would never have been diſcovered; without imagination and affection, the underſtanding would have lain torpid and inactive. Fancy, that noble and neceſſary power, has placed the ſubject in every poſſible combination of form and circumſtance, has called in to its aid ideas, images, and analogies, which, at firſt, ſeemed moſt foreign and inapplicable; and has thus beheld it in aſpects, which the dull plodder would never have *imagined*. By this means, a knowledge is acquired, various, extenſive, and exact, beyond what *could* otherways, have poſſibly been obtained. The office of the underſtanding, is, merely that of a *judge*, to paſs *ſentence* upon the cauſe before it. The imagination collects and arranges the *evidence*, and brings it before the deciding power, in ſuch a form, as may lead to an accurate and judicious determination.

This influence of the imagination and paſſions upon the judgment muſt, however, differ greatly, according to the different *kinds* of *evidence*, of which different *ſubjects* are capable. In *mere mathematics*, where the mind has to contemplate *pure demonſtrative* truth, little more is neceſſary, than

than ſuch a degree of *memory*, as to keep in view the ſteps of the proceſs, and ſo much *underſtanding*, as to be able to apply the plaineſt axioms, and to ſee the truth of *demonſtration*. Surely, no *great* exertion or exaltation of mind is neceſſary to *this*. You would not call that a *ſuperior ſpirit*, which was able to ſee, with infallible certainty, truths, of which, when properly underſtood, it is impoſſible to doubt.

Here, we grant, high degrees of imagination, ſenſibility, taſte, are *not* neceſſary. A mind, which *could not* ſee the certainty of *ſuch* concluſions, if able to trace, and to remember the ſteps by which it had proceeded, would *hardly* deſerve to be called rational.

Thoſe, certainly, are the *greateſt* and *nobleſt* ſpirits, who can exert the *whole collected powers* of their minds, upon the contemplation of important ſubjects, and determine, with clearneſs and truth, where the evidence is *not* ſo irreſiſtible, as that the concluſion cannot poſſibly be miſtaken. The moſt *common*, the moſt *important*, the *greateſt* ſubjects which can come before the human mind, are not capable of *demonſtrative* evidence. Yet, they *have* evidence of a peculiar kind, which can only be diſcerned, in its full proportion, by a mind, properly prepared to receive it. Beſides memory and underſtanding, you muſt call in *other*

powers. The *heart* muſt be in right order. The mind muſt *feel* and *imagine* juſtly, in order to a perfect ſentence.

Let us take, for an illuſtration, one of the moſt reſpectable and uſeful profeſſions—that of a Phyſician. The ſcience *he* profeſſes, is not, ſurely, that of demonſtration. He will himſelf acknowledge, that it is only, a ſcience of probability. Suppoſe him devoid of imagination, and of feeling. How ill qualified would a merely mathematical mind be, to preſcribe, in caſes which demand, and almoſt *every* caſe in *ſome* degree demands, preſence of mind, largeneſs of thought, a view to remote and poſſible conſequences, together with that quickneſs, penetration, and ſagacity, which muſt unite together, to conſtitute the *ſkilful phyſician!*—Take common life. What is *Prudence*, but another name, for an ability to *imagine* all the poſſible or probable conſequences of ſuch or ſuch a conduct, of foreſeeing ſuch and ſuch difficulties, and of balancing the good and evil, in ſuch a manner, as, upon the whole, to avoid the greateſt evil, and to obtain the greateſt good? But how could this poſſibly be done, without a lively, active, and well directed imagination?

Nay, we may go farther and ſay, that even a Mathematician will make very little progreſs in *demonſtrative* ſcience, without the aid of this noble, but much miſtaken and abuſed faculty.

Here,

Here, it is true, imagination has the narroweſt range: but it would be falſe to ſay, it has no range at all. For what are the ſubjects of his boaſted reaſonings? They are *points*, *lines*, *ſuperficies*, all of which he can only *imagine*. A *Point* has neither length, breadth, nor thickneſs. A *Line* has length, but neither breadth, nor thickneſs. A *Superficies* has length, breadth, but not thickneſs. Are then Lines, Points, or Superficies, objects of viſion, or of ſenſe? By no means. They are the mere creatures of fancy. His *Figures* likewiſe of circles, ſquares, &c. are not perfect. They contain innumerable excreſcences, and deformities; and yet, his reaſonings ſuppoſe figures exact and faultleſs.

And, how often muſt imagination preſent before him, diſtances, heights, orbits, &c. which he has not immediately under his eye, which he *cannot poſſibly* concieve, without the aid of fancy? The application of mathematics to Aſtronomy, Navigation, &c. demands the *ſame* aſſiſtance. Who would ſcruple to ſay, that Sir Iſaac Newton, enjoyed a *brilliant imagination?* In ſketching the outlines of his amazing ſyſtem—in roving through the pathleſs wilds of ſpace—in contemplating

"The dependencies,
"The bearings, and the ties"

of this ſtupendous univerſe, muſt he not have poſſeſſed a fancy of the *boldeſt wing*, yet accompanied, in all its flight, by the moſt wiſe

and watchful reaſon? Let me juſt mention another exalted character, in proof of the ſame point—Mr. Locke. No where do you perceive ſtronger lines of a vigorous and active fancy, than in the writings of this immortal philoſopher. His ſtile is *full* of imagery and alluſion, the moſt beautiful and happy. He has all the ſignatures of a *glowing*, and, at the ſame time, of a *ſober* and *cautious* mind. For *ſuch* imagination only do I plead—under the *command*, and employed in the *ſervice*, of that judgment, whoſe province it is, to direct, and to control.

Even in the act of REASONING, which is generally eſteemed the moſt ſolemn and ſerious proceſs of the mind, imagination is eſſentially neceſſary. For if the mind be not able to chuſe with advantage thoſe intermediate ideas, on which its reaſonings depend; if it is not able, by means of this excurſive power, to range abroad, to view its ſubject on every ſide, to catch minuter, as well as larger ſimilitudes and differences; if, in one word, it has not activity, comprehenſion, quickneſs, all which depend chiefly upon imagination, it will not poſſeſs, in any conſiderable ſtrength, that ILLATIVE POWER, which we acknowledge to be ſo noble a faculty of human nature.

If the preceding obſervations are true, with reſpect to mathematics—the region of ſcience which ſeems *moſt remote* from the fairy land of fancy,

fancy, there will be little difficulty in proving our point with reſpect to *thoſe* provinces, which lie nearer to its confines. And, in its *own province*, in all that extenſive and beautiful domain, in which *the pleaſures of the imagination* grow, as in their *native* ſoil, it would be ridiculous to aſk, whether imagination be not conducive to exactneſs of judgment. It would be juſt the ſame, as to inquire, whether a man muſt have *eyes*, to judge of *viſible* objects; or *ears*, to judge of *ſounds*. Through all the wide empire of criticiſm, of taſte, of poetry, of painting, of muſic, of arts, fancy reigns with almoſt ſovereign ſway. A poet, or an artiſt, without *imagination*, might as well be without *ideas*. Mr. Hayley has very juſtly obſerved, "That three things "are neceſſary to conſtitute a ſound critic— "Good *underſtanding*—lively *imagination*—refined "*ſenſibility*." * *In general*, to judge well upon *any* ſubject, you muſt have a *kindred* ſpirit. If the *poet* muſt be "alive to fancy," a *reader* of poetry muſt inherit a *portion* of the ſame inſpiration.

Let us ſuppoſe a critic, ſuch as, pehaps, the world has ſometimes ſeen aſſuming the name, to paſs ſentence upon Milton's Paradiſe Loſt. Does he reliſh and enjoy this divine performance? Does he taſte its exquiſite beauties? Does his imagination glow with its deſcriptions? Does

* Hayley's Eſſay on Epic Poetry. Notes to the firſt Book.

he ſenſibly feel the ſweetneſs, richneſs, and loftineſs of its language? Is he alive to all the ſuperior charms of its ſubject, its ſcenery, and its execution? Alas! No. Like the fly on St. Paul's Cathedral, he ſtumbles at a ſtraw, or a hair. But, is this cold-blooded *thing*, whoſe ſcanty ſoul cannot expand itſelf to the dimenſions of ſuch a ſubject, who cannot take in, at one grand and ennobling view, its whole extent and adjuſtment, the connection of its parts, the characters, the machinery, the end—is *he* the proper critic of Milton?*

* "How did Garrick ſpeak the ſoliloquy laſt night?" "Oh! Againſt all rule, my Lord, moſt ungrammatically. "Between the nominative caſe, which, your Lordſhip "knows, ſhould govern the verb, he ſuſpended his voice "a dozen times; three ſeconds, and three fifths, my Lord, "each time." "Admirable grammarian!" "But, in "ſuſpending his voice—was the ſenſe ſuſpended likewiſe? "Did no expreſſion of attitude or countenance fill up the "chaſm? Was the eye ſilent? Did you narrowly look?"—"I looked only at the ſtop-watch, my Lord."—"Excellent obſerver!"

"And what of this new book the whole world makes ſuch "a rout about?—"Oh! it is quite out of all plumb, my "Lord.—Quite an irregular thing! Not one of the "angles at the four corners was a right angle.—I had my "rule and compaſſes, my Lord, in my pocket."—"Excellent critic!"

"And for the epic poem your Lordſhip bid me look "at—upon taking the length, breadth, heighth, and "depth of it, and trying them at home upon an exact "ſcale of Boſſu's—'tis out, my Lord, in every one of "its dimenſions"—"Admirable connoiſſeur!" Sterne.

Imagination

Imagination is neceſſary to repreſent to the mind, all things *diſtant*, *future*, *inviſible*, and even *paſt*, when they are not *exactly* recalled by *memory*. How wide! How important its province! In RELIGION, the happineſs of Heaven, the nature, character, and employment of ſuperior beings, the ſolemn proceſſes of Judgment—Eternity—and even the Deity himſelf, *can only* come before us, as drawn by the imagination.

In *Hiſtory*, you continually *imagine* characters, events, times, places, circumſtances, which you have never ſeen. Theſe are portrayed to your fancy, by the pen of the hiſtorian; and your pleaſure and improvement will very much depend upon the clearneſs and celerity, with which you *paint* to yourſelf the different ſcenes, which are paſſing before you. All the pleaſures of *Taſte* depend abſolutely upon a vigorous and cultivated imagination. Even in the *actual contemplation* of the *ſcenes of nature*, *imagination* is as neceſſary, to refined pleaſure, as the *eye*. Perhaps we might, without great impropriety, call it, the *eye of the mind*. If any perſon ſhould think, this appellation would *better* belong to the *underſtanding*, let him recollect, that the eye of the *body* can give no *exact* information, till *rectified* by the judgment. It is ſo with the imagination. The ideas *it* preſents muſt be brought before the higher tribunal of the

underſtanding, and receive their ſentence, according to its ſuperior determination.

I ſhall, perhaps, be told of the *lover*, who ſees in his miſtreſs an *imaginary* idol, decked all o'er with charms, perfect and matchleſs, in every air, and in every attribute. I ſhall be told, of the amazing *change* in his judgment, when time and better knowledge have taken the glare from the object, ſtripped the idol of her divinity, and faded her charms, even to uglineſs. But, againſt this exception we meant to guard, by maintaining only, a *due poiſe* and *degree* of the imaginative quality.

" The *lover*, the *lunatic*, and the *poet*, are
" Of imagination ALL COMPACT." Shakeſpeare.

Minds, ſo *exceſſively imaginative*, cannot be judicious.

But, on the other hand, ſuppoſe a perſon to contemplate excellence, *female excellence*, without imagination—juſt as he would, a mathematical problem. Would he do *more exact* and impartial juſtice to the ſubject?

Would the fairer ſex conſent to abide the ſentence of *ſuch a judge?* Would they not *juſtly* complain, that though he wore the *form*, he had not the ſentiment, the *ſoul* of a human being? Would they not appeal—and who would not *juſtify* the appeal—to the deciſion of a *mind*, capable of feeling, and of fancy, and therefore *rational*,

*rational*, and *alone* competent to judge of that excellence, which is fitted to cheer and captivate the heart?

But it has been the hard fate of imagination to be, in general, ſpoken of, in its *exceſs*. We ſeldom hear it mentioned, by thoſe who declaim againſt it, without hearing of the *flights* of fancy, the *extravagance*, the *agitation*, the wildneſs, the *ſallies*, the *fervours*, the *excentricities*, of a *heated* imagination. The *fervour*, the *glow*, however, belong rather to *paſſion*, than to, *imagination*. The imagination indeed may *excite* the paſſion; and thus they aſcribe the attributes of the *effect* to the *cauſe*.

That imagination *may*, that it often *does* tranſgreſs its proper bounds, we moſt readily acknowledge. That it is neceſſary to hold it in with a *tight rein*, that it may not run away with the underſtanding, and lead to concluſions fanciful and groundleſs, we allow, in its fulleſt extent. We contend only for *that degree*, which will conſiſt with the exactneſs of judgment.

The vivacity and ſtrength of imagination, in children, is aſtoniſhing. Their knowledge of objects being very ſlight and ſuperficial, a few faint reſemblances are ſufficient to realize and embody them. By degrees, as their knowledge becomes more extenſive and exact, their power of *imagining* declines, the power of *judging* is improved, and when theſe two powers have attained

attained their *proper balance*, the mind has attained its higheſt capacity.

That "*great wits are to madneſs near allied.*" That "great genius's are too imaginative," proves only, that the mind, when in a frame too *creative* and *fanciful*, is not ſufficiently judicious. But, ſurely, a *degree* of warmth may be *neceſſary* to a tool, for its *proper* action; and yet, that warmth may be increaſed, till it is improper for ſervice.

It will, perhaps, be ſaid, that lunatics and madmen are under the dominion of fancy, and that upon this account their judgments are erroneous. It is anſwered, that, in general, if you will but grant their *premiſes*, they will reaſon from them, with aſtoniſhing quickneſs and clearneſs of argumentation. Unhappily, their minds are, in ſome particular points, by wrong aſſociations, become deranged and extravagant. This is their *diſeaſe*. But the fervour imparted to their minds, ſeems rather to have ſharpened, than impaired, their reaſoning powers.

Let, then, *underſtanding* and *judgment* ever be conſidered as the *preſiding faculties* of the human ſpirit. To their control, let every other power ultimately ſubmit. Let the *imagination* and the *paſſions* be conſidered merely as their *ſervants*, obedient to their command. But, whilſt they are thus obedient, let them have the praiſe of *good* and *uſeful* ſervants; and above all, let them

not

not be compelled to criminate and condemn *themſelves*. Or, according to the juſt ſimile of the poet.

" Whilſt *reaſon* holds the helm—
" Let *paſſion* be the gale." Pope.

And let *imagination* fly abroad to collect the various ſcattered breezes, which, thus united into *one* ſtrong current, may carry the veſſel forward, acroſs the ocean of life, under *ſuch a* pilotage, with ſafety, and ſatisfaction.

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## *An* Essay *on the* Ascent *of* Vapour. *By* A. Eason, M. D. *&c.* *Read Nov.* 27, 1782.

- - - - - - - - - - - - Unde ſerenas
Ventus agat nubes, quod cogitet humidus
Auſter, Sol tibi ſigna dabit.

*Vir.* Geo. C. I. ver. 461.

THERE are few phenomena in nature, which have puzzled philoſophers more, than the aſcent of vapour: and the different theories laid down by Doctors *Halley* and *Deſaguliers*, have been rejected, while another, not leſs liable to objections, has been almoſt univerſally received.

This theory, which I ſhall preſently mention, was at firſt invented by a French Gentleman, Monſieur

Monſieur le Roi, and afterwards revived by Lord *Kaimes*, and Doctor *Hugh Hamilton*. It is this—That the air diſſolves water, as water does ſaline ſubſtances: the ſolution being perfect, the air will become tranſparent.

Objections. 1. Were this theory true, evaporation could not be performed without air; but Mr. Watt, contrary to the theory ſupported by Lord Kaimes and Dr. Hamilton, has proved, that when water in vacuo was boiled with a degree of heat very little greater than that of the human body, the ſteam came over, and was condenſed in the refrigeratory. But he relates, that the evaporation was not quicker than in the open air.

2. Were the doctrine of ſolution true, the air would be heavier, the more water it contained; and, as clouds contain a great portion of water, they ought to float on the ſurface of the earth, and not in the higher regions, as we daily obſerve.

3. We never could expect any rain, unleſs the air were ſuperſaturated with water; and it would only yield to us, what it could not retain in ſolution.

4. It is univerſally allowed, that heat contributes, very much, towards converting water into vapour, which is again condenſed by cold. In what manner, will the doctrine of ſolution account for the ſpontaneous evaporation of water, and its being ſuſpended in air, in the coldeſt weather,

weather, even when the thermometer is below the freezing point? Though I cannot allow of ſuch a ſolution as above mentioned, I can, however, readily admit of a ſtrong attraction betwixt air and water; for no air is found without water, and no water without air.

Water, which is eight hundred times heavier than air, by a very ſmall degree of heat, may be converted into vapour, which vapour is one thouſand eight hundred times lighter than air, according to Mr. Watt. It conſequently follows, that vapour will riſe up in the atmoſphere, to the height of its own ſpecific gravity; but, long before it could reach to ſo high a region, it would be condenſed by cold, and return to the earth in rain, were it not for the latent heat * it contains, and the electric matter in the air.

Whatever I mention concerning Electricity, is from facts, and not from any theory, written about it, which is above my comprehenſion. But as the terms now in uſe, viz. poſitive and negative, or plus and minus, are generally beſt underſtood, I ſhall expreſs myſelf by them.

* That heat enters into vapour, and becomes an ingredient in it, is certain. For example: if we diſtil a pound of ſteam, the water in the refrigeratory will be heated by it, as much as by a pound of water heated one thouſand and twelve degrees; ſo eight hundred degrees of heat appear, though the ſteam is not ſenſibly hotter than boiling water, which is two hundred and twelve. *Exp.*

The

The able Nollet has proved, that water electrified, will evaporate faſter, than water which is not electrified. Does it not follow, that the more electric matter is in the air, the quicker the evaporation of water will be? And Mr. Cavallo has proved, that at all times the atmoſphere is electrified, but much ſtronger in froſty, than in warm weather; and by no means leſs in the night than in the day: it is likewiſe ſtronger in elevated, than in low places. From theſe facts, we may be enabled to account, why evaporation is carried on during very cold weather. All the heat contained in water, above what is ſufficient to keep it in a fluid ſtate, will convert it into vapour; which, in a north or north eaſt wind, when the electric matter greatly abounds, will be carried off with much rapidity; and, by the power of electricity, will be rendered ſtill lighter, the higher it aſcends; each particle repelling each other, and preventing the cold from condenſing the vapour, in its aſcent through the cold regions of the atmoſphere. The higher it riſes, the more ſpace there is for expanſion; and the more it is expanded, the clearer will the atmoſphere appear, and, probably, the higher the mercury will riſe in the barometer.

It likewiſe appears, that the electric matter is more ſenſible near the ſurface of the earth, in

cold

cold northern countries, than in warm ſouthern places. Mr. Volta, with a very ſimple apparatus, on the upper gallery of St. Paul's, produced an electric ſpark, which, he told me, in Italy, could not be done, but on a very high mountain, or in a ſituation greatly elevated. This ſeems a wiſe proviſion in nature, that the electric matter ſhould appear near the ſurface of the earth in cold climates, to raiſe up and ſuſpend the vapour in the air, which otherways, would be condenſed by the cold; whereas, in warm countries, the heat of the earth will be ſufficient to raiſe vapours to a great height, which are afterwards carried ſtill higher, by the electric matter in the upper regions. This, perhaps, is the cauſe, why the air is ſo clear and tranſparent in warm climates.

By making ſome obſervations on the falling of rain, we ſhall have other proofs, that the electric matter is the great cauſe, by which vapour is ſupported in the atmoſphere. Here I muſt obſerve a fact, well known to all preſent, that bodies electrified, by the ſame electric power (no matter whether poſitive or negative) repel each other; and when electrified by the different powers, that is, the one plus and the other minus, attract each other: on coming into contact, an equilibrium is reſtored, and neither of them will ſhew any ſigns of electricity.

From

From this it follows: If two clouds are electrified by the ſame power, they will repel each other, and the vapour be ſuſpended in both; but, when one is poſitive and the other negative, they will attract each other, and reſtore an equilibrium. The electric power, by which the vapour was ſuſpended, being now deſtroyed by the mutual action of the clouds on each other, the particles of water will have an opportunity of running together into each other, and, as they augment in ſize, will gain a greater degree of gravity, deſcending in ſmall rain, or a heavy ſhower, according to circumſtances.

A cloud, highly electrified, paſſing over a high building or mountain, may be attracted by, and be deprived of its electricity, without or with a violent exploſion of thunder. If the cloud is electrified plus, the fire will deſcend from the cloud to the mountain; but, if it be electrified minus, the fire will aſcend from the mountain to the cloud. In both caſes, the effect is the ſame, and generally, heavy rain immediately, or ſoon after, follows: this is well known to the inhabitants of, and travellers among, mountains.

From this, we can eaſily account, why thunder-ſhowers are often partial, falling near, or among mountains, and the rain in ſuch quantities, as to occaſion rivers to be overflowed; whilſt, at the diſtance of a few miles, the ground continues parched

parched up with drought, and the roads covered with duſt.*

It often happens, that one clap of thunder is not ſufficient to produce rain from a cloud, nor even a ſecond: in ſhort, the claps muſt be repeated, till an equilibrium is reſtored, and then the rain muſt, of conſequence, fall. Sometimes we may have violent thunder and lightning without rain, and the black appearance of the heavens may be changed to a clear tranſparent ſky, eſpecially in warm weather. To account for this, it muſt be remembered, as I lately ſaid, that one or more claps of thunder are not always ſufficient to produce rain from the clouds: ſo, if an equilibrium be not reſtored, little or no rain will fall, and in a ſhort time, the electric matter, paſſing from the earth to the clouds, or the ſuperabundant quantity in the air, will electrify thoſe black clouds, by which means the particles of vapour will be expanded, raiſed higher, and the air become clear. Clouds may be melted away, even when we are looking at them, by another cauſe, that is, by the

* Sæpe etiam immenſum cœlo venit agmen aquarum.
Et fædam glomerant tempeſtatem imbribus atris
Collectæ ex alto nubes.
Ipſe pater, mediâ nimbrorum in nocte, coruſcâ
Fulmina molitur dextrâ, quo maxima motu
Terra tremit. - - - - - *Virg.*

heat of the ſun. We know, that tranſparent bodies are not heated by the ſun, but opaque ones are; the clouds being opaque bodies, are warmed by the rays of the ſun ſhining on them, and any additional quantity of heat will rarify the vapour, and occaſion its expanding in the air, which will ſoon become tranſparent. When vapour is made to expand, more than it would otherwiſe do, a certain quantity of abſolute heat is neceſſary to keep it in the form of vapour; therefore, when the receiver of an air-pump is exhauſting, it appears muddy, and a number of drops are found within it; the moiſture contained in the air, in the form of vapour, being made to occupy a greater ſpace than what is natural to it, and receiving no addition of heat, a part of it it condenſed.*

If, therefore, the air is ſuddenly rarified, a few drops of rain will deſcend, as may often be obſerved in the ſummer ſeaſon.

I have repeatedly obſerved, eſpecially during the ſummer, when the wind is at north eaſt, that the weather is, in general, cold and dry, with a clear atmoſphere. Should the wind ſud-

* On this principle, we can readily account for the miſt, which appears, on diſcharging an air-gun: the condenſed air in the chamber of the barrel, on being ſet free, will expand ſuddenly, occupying a larger ſpace, and no additional heat being acquired, the vapours muſt neceſſarily be condenſed in the form of miſt.

denly

denly change to ſouth weſt, in a few hours, black clouds begin to gather, vegetables look ſickly, and droop their leaves; and, ſoon after, comes on a violent ſtorm of thunder, with heavy rain.*

This change, I imagine, is not ſo much owing to the ſouth weſt wind bringing rain, as to the atmoſphere's being changed from an electric ſtate, capable of ſuſpending vapour, to a ſtate of parting with its moiſture. As ſoon as the ſtorm is going off, vegetables revive from their languid ſtate, and the air recovers its uſual aſpect. From this we may conclude, that no inſtrument can be made to aſcertain the quantity of moiſture in the air: all that is, or ought to be expected from a hygrometer, is to ſhew, whether the air be in a ſtate to retain, or part with its moiſture. In apparent dry weather it may point to rain; and when it rains, it may point to fair. For this reaſon, the ſtones of halls, and ſmooth ſubſtances, are often bedewed with wet, in dry warm weather, (that is, the air is in a ſtate to part with its moiſture) and, *vice verſâ*, they will dry in the time of rain.

Leſt this paper ſhould exceed the common limits of time in reading, I ſhall paſs over thoſe obſervations, which might be made on fogs or miſts; a few excepted, which I ſhall ſubjoin in a

* "Ingeminant Auſtri, et denſiſſimus imber." *Virg.*

note.* I ſhall, therefore, conclude with a ſhort ſummary of the whole.

1. That, heat is the great cauſe, by which water is converted into vapour, which is condenſed by cold.

2. That, electricity renders vapour ſpecifically lighter, and adds to its abſolute heat, repelling its particles; which particles would be condenſed by cold: and that, electricity is the great agent by which vapour aſcends to the upper regions.

* Fogs are produced by two cauſes as different as their effects are oppoſite. A fog may be be produced by a precipitation of rain, in very ſmall particles, like a cloud floating on the ſurface of the earth. In this caſe the air is moiſt and damp, and never fails to wet a traveller's cloaths; the ſtones of the ſtreet, painted doors, and hard, cool, ſmooth bodies are generally covered with moiſture, which often runs in large drops: this, I dare ſay, has been obſerved by every perſon. Secondly, a fog may be produced by the abſorption of moiſture, when the air is too dry, and differs from the other juſt deſcribed; for it will not impart any of its moiſture even to dry bodies, ho damp is to be met with on ſtones, poliſhed marble, &c. This fact is well known to the inhabitants on the ſea coaſt of Fifeſhire, who during their ſummer months, have frequent opportunities of obſerving a fog in the afternoon, driving up the Firth of Forth, with a drying eaſt wind, which often blaſts the trees and young vegetables, and therefore, in a ſmall degree, reſembles the Harmattan in drying up the ground, and robbing vegetables of their moiſture.

3. That

3. That, when the electric power, by which vapour is ſuſpended in the atmoſphere, is deſtroyed, a heavy miſt, ſmall rain or thunder-ſhowers, will be the conſequence. Had the advocates for the doctrine of ſolution, made heat and electricity, the ſolvents, their theory would have been leſs exceptionable.*

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*On the* COMPARATIVE MERIT *of the* ANCIENTS *and* MODERNS, *with reſpect to the* IMITATIVE ARTS. *By Mr.* THOMAS KIRSHAW. *Read February* 19, 1783.

Vitaque tam longæ brevior non ſufficit Arti.
Freſnoy de arte Graphicâ.

THE life of man being too ſhort, and the extent of human abilities too confined, to make conſiderable improvements or inventions in any art, we ought to view the performances of celebrated men, with all the candour, and generoſity, they ſo well merit.

Even, after all the advantages we have received from the united ſtudies of ages, we may, with great juſtice ſay, how ſmall and imperfect is all our boaſted wiſdom, and, how much to be regretted is it, that we have not made a greater

* This paper is, through accident, placed out of the order in which it ſhould have been inſerted.

progreſs in the ſpacious field of ſcience!—This ſhort eſſay is intended to point out the excellencies of the ancients in the imitative arts: yet, at the ſame time, to allow the moderns their due ſhare of fame, in having, not only made ſome improvements, but inventions, of which the ancients were entirely ignorant.

There is not a doubt, but the ancients poſſeſſed a poliſhed taſte, and a critical knowledge of the various and exquiſite forms of beauty: they knew the arts, could only receive their perfection from ideal beauty ſuperior to what is ever found, in individual, and imperfect nature. There is no man equal, in ſtrength and proportion to the Farneſian Hercules: nor, any woman comparable, for ſymmetry of form, to Medicean Venus.

Theſe inſtances ſeem to prove, that the authors of the fineſt remains of antiquity formed to themſelves ideas of *perfect* nature, and collected from *various* individuals, what *no one* could ſupply.

It is ſaid, that Zeuxis, when he painted his Helena, ſelected five of the moſt beautiful virgins that could be found; and, whatever nature had formed moſt perfect in each, he united in a ſingle figure.

Thus painters, and ſculptors, render their ideas more perfect, and exalt their Art above

Nature

Nature herſelf. In this manner, by contemplating grand and exquiſite forms of beauty, the operations of the hand are directed by the image in the mind: but how far to proceed, and when to ſtop, muſt be left to the judgment of the artiſt.

That the ancients bear the palm from the moderns in ſculpture, will not be conteſted: their religion ſanctified and encouraged that branch of ſcience. Gods, Demigods, and Heroes, all conſpired to bring it into the higheſt repute: and their images were often depoſited in buildings of the moſt exquiſite taſte, to commemorate particular occurrences. The rage for highly ornamented edifices, perhaps never roſe to a greater height, than amongſt the Romans. Theſe ſons of fortune acquired ſo much wealth, and, by plundering diſtant climes, had ſo collected the riches of whole kingdoms into one city, that there was no way left to diſſipate ſuch immenſe ſums, but by engaging in the moſt expenſive works of art. Each ambitious conqueror, deſirous to tranſmit his own actions, and thoſe of his anceſtors to poſterity, called in to his aid the ſculptor, and the architect, whoſe utmoſt ſkill was exerted to blazon their atchievements in the ſolidity of ſtone and marble.

This ſhews, in ſome meaſure, why Sculpture outſtripped her ſiſter Art; for the ſpecimens of

ancient Painting are much inferior to modern productions. They are deficient in colouring, chiaro-obſcuro, and keeping. Several of the *Claſſics** tell us, there were but four colours or pigments in uſe amongſt the ancient artiſts, viz. black, white, yellow, and red. Now, it is impoſſible to produce, from thoſe colours only, the variety of tints neceſſary to equal even a tolerable colouriſt of the moderns. Although this evinces nothing againſt the *abilities* of the ancients, we may fairly conclude, that the rich and luxuriant deſcriptions, handed down to us, are inflated with hyperbole, ſufficient to make us doubt the veracity of ſome of their authors. Unfortunately for theſe warm advocates, the diſcoveries of Herculaneum have ſpitefully contradicted their aſſertions, and furniſhed us with means to draw our own concluſions. It is very poſſible they might admire, and be ſurprized at a ſight of, what appeared to them the ultimatum of perfection.

The ſtories of Zeuxis, and Polygnotus raiſe a ſmile. The former is ſaid to have painted fruits ſo naturally, that birds attempted to eat them; the latter to have delineated the character and features of the face ſo truly, that phyſiognomiſts, upon ſight of the portrait, could foretel the preciſe time of the party's death. Sir Joſhua Reynolds, who may be juſtly conſidered as the firſt artiſt in the world, thus delivers his opinion.

* Pliny, Cicero.

" In

" In antique paintings, there are not the " ſmalleſt traces to make us think, that what " we call light, and ſhade, or a diſtribution of " the work into maſſes, claimed any part of their " attention: theſe may be ranked amongſt the " defects of the learned *Pouſſin*,* as well as of " the antique paintings: and the moderns have a " right to that praiſe which is their due, for " having given ſo pleaſing an addition to the " ſplendour of the art. *Pouſſin*'s pure and cor- " rect ſtile was a direct contraſt to the florid " and inaccurate ſtile of *Rubens*†; yet the luxu- " riant brillancy and harmony of the latter, ſo " dazzles the eye, that we cannot help thinking " all his deficiencies are fully ſupplied." *Pouſſin* carried his veneration for the ancients ſo far, as to give his works the air of antique paintings. It is certain he copied ſome of them, particularly the marriage, in the Aldrobrandini palace at Rome; which, in the opinion of that great artiſt before mentioned, is the beſt relique of thoſe remote ages, that has hitherto been found. Thoſe of the antique paintings which ſtand foremoſt, are fine, and correct imitations of improved nature; with the chaſteſt outline; formed upon ſuch certain principles as no one

* *N. Pouſſin*, an eminent French painter. It ſhould have been noticed, whether it was *Nicholas*, or *Gaſper Pouſſin*.

† *Rubens*, a famous Flemiſh painter.

has

has yet dared to controvert. "But they have "a remarkable dryneſs of manner, which is, by "no means, recommended for imitation." The compoſitions of the ancients appear to be much better calculated for the chiſſel, than the pencil.

Chiaro-ſcuro, or the art of diſtributing the lights and ſhadows in a picture advantageouſly, as well for the repoſe, and ſatisfaction of the eye, as for the effect of the whole together, ſeems to be a modern invention. By the aſſiſtance of this part of ſcience, objects receive more relief, truth, and ſoundneſs. The maſſes of light and ſhade are formed by a proper diſtribution of objects, which, by an artful management, are ſo diſpoſed, that all the lights are on one ſide, and the ſhades on the other. Sometimes, reflected lights are neceſſary; at other times they are uſed, with a pictorical liberty, to produce the deſired effect; it is the knowledge of this that animates the canvas, and gives the appearance of corporeal ſubſtance to a flat ſurface. *Rembrandt*,* ſo far from ſelecting the moſt beautiful and graceful parts of nature, frequently made a bad choice from among the ſubjects ſhe affords. And, although he poſſeſſed a very moderate portion of true taſte, yet the fire and ſpirit, with which his pictures are finiſhed, cannot be ſeen without ſurprize; and the effect produced by his colour-

* *Rembrandt*, a great artiſt of the Flemiſh ſchool.

ing,

ing, and expreſſion, demand our admiration. His etchings are collected at a great expence for the cabinets of the curious. The ſame ſpirit, which flowed from his pencil, guided his needle. Had this eminent artiſt viſited Rome, and refined his taſte, it is ſuppoſed, with his profound knowledge of chiaro-ſcuro, and colouring, he would have been one of the firſt maſters in the world.

That part of the art, termed *keeping*, the ancients ſeem to have been but little acquainted with, and without a due management of this, every picture would be filled with confuſion. Inſtead of a proper ſubordination, each groupe or figure, would ſeem to contend for precedence. This want of order deſtroys all dignity, and prevents the artiſt from forming an agreeable whole.

Any attempts in antique landſcape, with which we are acquainted, are executed wretchedly. In that part of the art, the ſuperiority of the moderns is manifeſt.

We have the authority of *Freſnoy** to ſay, "that, Michael Angelo ſurpaſſed not only all "the moderns, but the ancients in architecture, "he quotes the St. Peters at Rome, the Palazzo "Farneſe, and the St. Johns at Florence, as "proofs of his opinion."

* *Freſnoy*, a French artiſt well known for his Latin poem de Arte Graphicâ,

Etching,

Etching, engraving, mezzotinto, and aqua-tinta are all of modern invention, and of great utility. They deliver down to us accurate copies from the works of eminent men at a ſmall expence; and diffuſe abroad the bright flame of ſcience, ſo that even thoſe, who are far diſtant from the centre of the arts, may rouſe their ſouls to action, and enlighten that ſpark of genius, which might hitherto have lain dormant. From theſe meritorious, and ingenious improvements, we can judge, with great certainty, of the various merits of an artiſt, and every part, but the colouring, may be critically examined.

The ſtile of the Italian, Flemiſh, or French ſchools, may be pointed out by theſe copies, and frequently the very manner of pencilling, by particular artiſts, is faithfully repreſented. Theſe arguments are not meant to depreciate the antiques, they will always engage our admiration, and moſt highly merit it.

The advantages, received by the moderns, from ſtudying the ancients, are freely acknowledged. It is no uncommon thing to hear ſome people lament the decay of genius, and the decline of arts, in theſe times, when compared with the Auguſtan age. However that may be, the moderns have a right to claim their full portion of fame, in many arts in which the ancients could not inſtruct them.

From

From the candour of this learned Society, the writer of this Eſſay claims protection, and hopes, an attempt to inveſtigate truth, will not be deemed audacity.

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## *On the* Impropriety *of allowing a* Bounty *to encourage the* Exportation of Corn, *&c.* *By* Joseph Wimpey.

IN the converſation on a paper read before this Society ſome time ſince, reſpecting the propriety of keeping œconomical regiſters; their uſe was queſtioned in reſpect to one of the principal objects, upon ſuppoſition, that a neceſſity for it did not exiſt; becauſe it had been obviated by meaſures adopted for that purpoſe. The object alluded to, is the exportation of corn. Notwithſtanding all that was urged againſt it, the writer is fully perſuaded, the meaſure recommended is well founded, the object of it of very great importance, and that men of very good abilities, have had their judgments miſled by inveterate popular prejudices, or falſe reaſoning. Impreſt with an idea of the great importance of the ſubject, he begs leave to ſubmit the following obſervations to the conſideration of the Society.

To

To maintain an argument, not founded on juſt principles, is like putting to ſea without compaſs or chart. As the veſſel would be the ſport of the waves and winds; ſo would ſuch a reaſoner lie at the mercy of the boiſterous ſtorms of his paſſions, and the uncertain bias of his inclinations. To avoid both, let us premiſe certain propoſitions, where truth is not only conſonant to reaſon, but confirmed by experience, and acknowledged facts.

## PROPOSITIONS.

1. The prime object of civil ſociety, is the happineſs of the members of whom it is compoſed. No government can be juſt, whoſe ſupport and defence do not extend to the equal, and indiſcriminate benefit of the whole.

2. Though the good and protection of each individual, is either virtually implied, or formally conditioned or articled for; yet it cannot juſtly extend further, than may be conſiſtent with public good: for, the rights of all men are the ſame, and it is ſhocking to common ſenſe to ſuppoſe, that one man, or one claſs of men, might, with juſtice, be made rich, great, and happy, by the miſery and ſufferings of a hundred men, or at the expence of the reſt of the community. No government ever intended men ſhould live *upon* one another, but be equally advantaged

advantaged by the mutual assistance, given to the common support, of which every individual is entitled to an equal share.

3. Public good is the barometer, or, if I may use the expression, the political balance, by which the specific gravity, the intrinsic worth, or sterling value, of every measure, respecting the public, is to be determined and ascertained. Therefore, every measure, which has a tendency to promote public good, is right and desirable: every measure, which is inimical to the public interest, is a wrong measure, and should be reprobated. To say otherwise, would be repugnant to common sense, therefore false and absurd.

4. The projects of individuals, in which the good of the public is ultimately included, have been very deservedly countenanced by public encouragement: but such encouragement cannot consistently be continued longer than the establishment of such projects; for if they could not support themselves, and reward the projectors, they would be absurd projects, and should be abandoned, as by propositions second and third; the individual is not to be enriched, at the unjust expence and loss of the public. Now, all the bounties, of whatever nature or kind, whether they respect produce, manufactures, or commerce, are public encouragements; and their origin and existence depend, upon the reasonable

expectation

expectation of their being ſubſervient to public good; if they are found not to anſwer that purpoſe, they ſhould be execrated and abandoned as public evils, as appears by the foregoing propoſitions.

5. Cheap and dear are relative terms; and are meaſured or eſtimated, by their riſe or fall above the medium value. The medium value of things may be eſtimated, at the price they ſtand the grower, the breeder, or the manufacturer in, with a reaſonable profit on the ſame, for the maintenance of himſelf and family, be the commodity whatever it may. If it deviates from that ſtandard, it will be dear, in proportion to its advance above it, or cheap, as it falls below it. But cheap and dear, being relative terms, they muſt depend on ſomething elſe for their exiſtence; and this is very well known to be ſcarcity and plenty. If the demand for any commodity is encreaſed, beyond the quantity adequate to the ſupply, its price is neceſſarily advanced. But if the quantity exceeds the demand, the price as neceſſarily falls; and it is not in human power to prevent it. From hence follows:

6. Propoſition. Whatever meaſure, rule, or law, increaſes the quantity of any commodity, in proportion to the demand for it, neceſſarily makes it cheaper; and whatever increaſes the demand,

demand, in proportion to the quantity, as neceſſarily renders it dearer.

Now, there is hardly any public queſtion reſpecting agriculture, manufactures, or commerce, but its expedience and uſe may be aſcertained by ſome one, or more, of theſe propoſitions.

The queſtion before us is of the greateſt importance: there is not a *ſubject* in the *realm*, whoſe intereſt is not affected by it. Nothing can be more intereſting, than that proper meaſures ſhould be taken reſpecting an article, upon which the people depend for their daily ſubſiſtence. It is a meaſure, however, in which men of good ſenſe have been deceived and deluded; by which *millions* have been fooliſhly thrown away, to the advantage of our neighbours; and which, to this hour, has its advocates, who contend, not only for its continuance, but alſo for its extenſion. But the effects of popular prejudice are indeed very ſurprizing.—Let us firſt take a curſory view of its hiſtory, and then try its merit by the foregoing propoſitions.

Patriotiſm, genuine patriotiſm, is a word of noble ſignification. But, a true patriot, one who, in all things, at all times, and upon all occaſions, prefers the good of the community to his own private intereſt, would be as ſingular a phenomenon in the political world, as a Phœnix in the natural. It is an object one may

contemplate with pleaſure; but rarely be indulged with the ſight of. Legiſlators, like Judges, ſhould be incorrupt: their ears ſhould be open to no voice, but that of truth. But where ſhall we find thoſe, who have no intereſt in the laws they enact; or thoſe, who can diveſt themſelves of the influence of ſuch intereſt?

Unhappily, the landed intereſt of the country is placed in oppoſition to that of commerce, and they contemplate each other with an evil eye. This has a pernicious tendency; ſince they are connected together, like links in a chain, and ſince their ſafety and intereſt depend upon their union. Neither could ſubſiſt long without reciprocal aid.—But to proceed to facts.

One of the calamities of the civil war was, a ſcarcity and dearneſs of proviſions. When peace was reſtored, men betook themſelves to their civil occupations, and agriculture was encouraged by men of ability. In 1687, wheat was at a lower price, than it had been at any time in the century; ſomewhere from three ſhillings, to three and four-pence a buſhel. The circumſtances of the farmers, of thoſe days, were very different from the preſent. If the prices were low, they were, notwithſtanding, obliged to go to market: nor could they keep large ſtocks, for a change of times, and an advance of price. Therefore, when corn ſold low, their rents were ill paid, and the land-owner was affected by, and partook of, the diſtreſs of his tenant.

tenant. To remedy this, the bounty was deviſed, and a market was procured abroad: for it was clearly ſeen, as the demand increaſed, the price *muſt* do ſo too; and the event fully evinced the policy of the meaſure, for the year following, the price was nearly double. Could this relief have been given to the farmer and land-owner, without injury to the reſt of the community, it would have been juſt: but, when it is conſidered, that there is no one, even in the loweſt circumſtances of life, who is not taxed to pay the bounty, perhaps it will appear rather cruel, to oblige poor wretches, who with the greateſt care and induſtry, cannot provide bread ſufficient to ſupport their families, to contribute towards the enriching of the farmer, and increaſing of the rent of the land-owner.

But, what ſays the advocate for the bounty? Why, he tells you, that the time of granting it is the great æra, from which, improvements in agriculture are to be dated. That at the ſame time, it has benefitted the land-owner and the farmer, has added to the riches of the nation, and has lowered the price of corn, which is a common bleſſing to all. That it has been very beneficial to the land-owner and farmer, we not only admit, but have proved; but that it has added to the riches of the nation, is denied: and that it ſhould be the means of lowering the price of corn, is contradictory, abſurd, and impoſſible. But it is ſaid, it *has*

lowered the price, and the fact is indisputable.—Facts, indeed, are stubborn things, and not to be warped to accommodate any body. But, be it remembered, assertions are not facts: and any one, who is remarkable for *fearlessness* of assertion, can never be depended upon for facts.

What effect the bounty had upon the price of corn, can only be known, by comparing the prices for a considerable number of years, before that measure was adopted, with the same number of years after. This, and this only, is the true method of ascertaining the fact. But to compare plentiful years with years of scarcity, can only serve to expose the fraud and artifice of the writer, and to impose upon the credulity of the reader. The following is a true state of the fact, as any one may satisfy himself, who will be at the trouble of inspecting the Windsor Tables, which he may find in Bishop *Fleetwood's Chronicon Pretiosum*, in four tracts relating to corn: and, I think, in one of the volumes of *Museum Rusticum et Commerciale*. The fact is, if the average price of corn be taken from those tables, for twenty-five or thirty years before the bounty was enacted, and for the same term after, it will appear, that the price was considerably lower before the bounty, than it was after. This was the time for discovering the effects of the bounty; and the fact is, it advanced the price, nearly double, the first year.

We

We will now ſhew, that the natural and neceſſary tendency of the bounty is, to raiſe the price; and that it is impoſſible it ſhould do otherwiſe; and therefore abſurd to aſſert it. The advocates for the meaſure ſay, "It encourages the farmer to grow more corn, by providing a market abroad; this makes it more plentiful, and conſequently cheaper." This, in fact, is ſaying, the farmer has more encouragement to grow corn, when the price is lower, than when it is higher. The market is nothing to him, abſtracted from the price. When he ſells his corn, he neither knows nor cares what becomes of it afterwards: he looks only to the price. If it affords him a reaſonable profit, he proceeds with alacrity; and his diligence and induſtry will be excited in proportion to his gain. But, it ſeems, the bounty lowers the price and renders it cheaper, and, at the ſame time, encourages the farmer to extend its culture, and grow larger quantities, than he would otherwiſe do! This is the land-owner's argument; but where is the man, who can reconcile it to *common ſenſe?* Repugnant as this is to the common ſenſe of mankind, it is the great argument made uſe of, not only to continue the bounty, but to increaſe and extend it. I could, therefore, wiſh, as it is a queſtion of very great importance, to be permitted to ſift it to the bottom.

The farmer ſtands on the ſame ground as the manufacturer: every article of his farm ſtands him in a certain price; and, if he cannot ſell it for a profit, ſufficient to maintain himſelf and family, in time he muſt waſte his capital, and come to ruin. Suppoſe he cannot grow wheat under four ſhillings a buſhel, which is about the average coſt: it is evident, he muſt ſell it for more than four ſhillings, or he loſes by that article. Now, if the bounty (as the advocates for it maintain) lowers the price, is it poſſible to conceive, that it ſhould encourage the farmer to extend its culture? Or rather, is it not ſelf-evident, that it would not only diſcourage his ſowing corn, but neceſſitate him to diſcontinue the practice, to ſave himſelf from ruin? Put a ſimilar queſtion to any Gentleman here, who is verſed in manufactures of any kind. Suppoſe a Velveret ſtands him in four ſhillings a yard: ſo long as he can ſell it for four ſhillings and ſix-pence, or five ſhillings, he will be encouraged to make as much as he can: but let any meaſure be adopted which falls the price to three ſhillings and ſixpence, would he not immediately relinquiſh that branch, and betake himſelf to ſomething elſe? Surely he would. And, why ſhould not the farmer, for the very ſame reaſon, abandon the planting of wheat, when the bounty has lowered the price ſo, that a buſhel, which ſtands him in four ſhillings, he can only

only ſell for three ſhillings and ſix-pence, three ſhillings, two ſhillings and ſixpence, or even but two ſhillings; for, at all theſe prices has wheat been exported? It is plain then, if the price of grain is lower now, than it was in any former period, it muſt be owing to ſome other cauſe; for a bounty has a directly contrary effect.

Another argument for the bounty is, That it encourages exportation; and, as corn is the produce of our own lands, it greatly increaſes the riches of our country.

I anſwer—To object to the exportation of corn, or any other article of commerce, when it can be done on advantageous terms, would be extreme folly. But exportation, procured by means of a bounty, is ſo far from being advantageous, that it deſtroys, for the moſt part, all poſſibility of advantage: even of real, ſubſtantial advantage, which muſt, and would happen, if not prevented by the bounty. Every man is thoroughly ſenſible, that, if he purſues a buſineſs by which he is a loſer, the longer he continues in it, and the larger his dealings, the more he ſuffers by it. Juſt ſo it operates in regard to the public; for the public and individuals only differ, as greater and leſſer: and the loſs of the one is in exact proportion to that of the other. To ſhew this, let us ſuppoſe, for example, as before, that wheat ſtands the farmer in four ſhillings a buſhel: that the preſent market price,

however, is no more than three ſhillings, and that there is not a ſufficient demand even at that. The legiſlature, to relieve the farmer, and accommodate its members, gives a bounty of five ſhillings a quarter, or ſeven-pence halfpenny a buſhel, to procure a market abroad. And is it not a *bleſſed* relief which it affords? In the firſt place, the farmer ſells for three ſhillings what coſt him four ſhillings; and, towards that three ſhillings, the public pay ſeven-pence halfpenny. The firſt is a loſs of twenty five per cent. and the latter of more than twenty; making together, above forty-five per cent.! What a glorious trade for *England*, attended with ſuch immenſe advantages! But how much better for the ſagacious Dutchman, who buys a commodity at forty five per cent. below its real value, which, in the ſpace of twelve or eighteen months, there is almoſt a certainty of ſelling again, ſometimes in the ſame market, at a hundred per cent. profit.

But it may be aſked, what is to be done, when the nation is ſo unfortunate, as to be overwhelmed with ſuch an abundance: for it muſt be obſerved, ſuch low prices never happen, but in conſequence of a ſeries of propitious ſeaſons? I anſwer, we ſhould then imitate the Dutch, and ſtore up our corn when cheap, that, when unfruitful ſeaſons come, we may, like them, ſell it at a large profit without a bounty, with a ſaving of £200,000 a year to the public. This, I think,

think, is about the average ſum we have annually paid for bounties, and is ſufficient to purchaſe about a fourth of the corn, we have uſually exported. But, giving a bounty of twenty per cent. to export corn, when the price is ſo low, leaves ſo little upon hand, that the firſt bad ſeaſon which comes, raiſes the price to double; and then, when you ſhould ſell for a profit, you have no corn; but are forced to prohibit exportation, even without a bounty, or to import from abroad, at double the price you ſold at. It is now about ninety-five years, ſince the bounty commenced, and thus it has operated from the beginning. The firſt unfavourable ſeaſon, after a year of large exportation, hath conſtantly raiſed the price immoderately, as appears from the tables above-mentioned, and it is impoſſible it ſhould be otherwiſe.

It has been alſo obſerved, that in *Italy*, and other places, where corn is not permitted to be ſent abroad, it is always dear. Doubtleſs it is. We have no objection to exportation, when we have any corn to ſpare: on the contrary, we recommend the practice. But, is there no difference, between giving a bounty of twenty per cent. to force a trade, which reduces you to almoſt a famine, and ſelling at a fair average price, which obtains all over *Europe?* The former impoveriſhes and diſtreſſes you; while the other, if you had any corn to ſell, would infalli-

bly

bly enrich you. The exportation of corn, upon fair and juſt principles, would be a very valuable article of commerce; and not leſs ſo, in a national view, than a private one, to the land-owner and farmer: but ſo execrable has been our management, by forcing a market with the loſs of from thirty to fifty per cent. that when a ſcarcity comes, when the price advances, and we ſhould gain fifty per cent. inſtead of having corn to ſell, we are forced to buy, and often to give double the price we ſold at.

We quite miſtake the matter, in ſuppoſing, the laws, in being, have provided a ſufficient remedy: no law ever was, or ever can be, effectual to that purpoſe, while a bounty ſubſiſts. It is in vain to think, that trade, like water, will find its own level, when ſo large a ſluice is opened to deſtroy that level. We may as well throw a quarter of a hundred weight into one ſcale, to preſerve its equilibrium, as to give a bounty of twenty per cent. to put us upon an equal footing with the other corn-markets in *Europe*.

The impropriety of the bounty is not leſs apparent, in the influence it has on the farmer's conduct. It often tempts him to plant wheat on land, which is not ſuited to it; and ſometimes, two or three years together, on the ſame land; which too often proves a great loſs to himſelf, and alſo to the public. For the farmer

cannot

cannot ſuffer materially in the failure or loſs of his crops, but the public will be affected by it: and, what is worſe, while he plants wheat, for the ſale of which the public are loaded with a heavy tax, he omits planting other grain, which *England* is obliged to import from abroad. At the ſame time that we have paid two hundred thouſand pounds a year for bounties on corn exported, we have paid five hundred thouſand pounds for oats imported, making together ſeven hundred thouſand pounds. Can a more ſtriking proof of the folly of the meaſure be deſired, than giving ſuch a ſum to force a trade in one article, which neceſſarily obliges us to be purchaſers for ſo large a ſum in another, without any the leaſt allowance whatever?

But, there are thoſe who would perſuade us, that to grow corn, or trade in it to any advantage, our ports ſhould be always open, that the merchant might export or import, as beſt ſuited his intereſt. If the merchant were the only man in the kingdom whoſe welfare was to be conſidered, perhaps it might be right; or, if mankind conſidered all nations as brethren, among whom charity univerſally prevailed, the maxim might be juſt. But whilſt neighbouring nations calculate their own intereſt, by the loſs of it in others, the country which ſhould be anxious to provide bread for its neighbours, would be ſure to want it for itſelf. On this

plan,

plan, what would become of the farmer and land-owner? I anſwer both would be totally ruined. In moſt countries in *Europe*, both land and labour are ſo much cheaper than in *England*, that, in fruitful ſeaſons, grain would be poured in upon us in ſuch immenſe quantities, and the price ſo far reduced, that the farmer muſt give up his buſineſs, and the land-owner cultivate his land, for the bare maintenance of his family. On the other hand, when the ſeaſons proved unfavourable, and the crops were inſufficient, our ports might be open to no purpoſe; no corn would arrive; the unavoidable conſequence would be, a general famine; and under the influence of ſuch an execrable meaſure, it would not be in the art or power of man to prevent it. It is not in corn only, that high cuſtoms, prohibitory and penal laws, are abſolutely neceſſary, but in very numerous branches of manufactures; indeed, in manufacture almoſt the whole of linen and ſilk. Vaſt quantities of the former are imported under duties of, from eighteen to twenty-five or thirty per cent; and a vaſt variety of ſmall wares at twenty-five; and one article at almoſt cent. per cent. Even fine broad-cloth, which is a ſtaple commodity of this kingdom, I have known imported under an inſurance of twenty-five per cent. *ad valorum*. In ſhort, were our ports open to all, as ſome Politicians adviſe,

adviſe, the *Engliſh* mechanic muſt do as much work for three-pence, at leaſt, as he now does for a ſhilling; and then I aver, he would be much better paid, than an ingenious workman now is in *France*.

But, as I find ſome Gentlemen, the moſt reſpectable in general for their judgment, think differently on this ſubject, I wiſh to give it a little further inveſtigation. I remember Monſieur *Turgot* (who was, at leaſt, as reſpectable for his humanity as for his penetration, and in neither, perhaps, much inferior to any man) thought it was a cruel meaſure to ſhut the ports, and keep back our corn, when ſo many provinces were ſtarving for want of it. He contended, it was a narrow policy, and that general happineſs requires, that the ports ſhould be always open, and commerce left to thoſe whoſe buſineſs it was to purſue it. This, I obſerve, was trying the queſtion by the laws of humanity, and not by the policy of ſtates; and particularly, not by the politics of the court of *France*, in one of the firſt departments of which he, at that time, filled a diſtinguiſhed place, with much honour.

If the laws of juſtice and humanity univerſally prevailed, and every man, of whatever country or nation, eſteemed every other man as his brother and his friend, if all men had but one

one common object of purſuit, viz. the general peace and happineſs of mankind; and if each individual were content with his proportion of good, as it aroſe from the general ſtock, commerce and every thing elſe would put on a very different face.

It would be loſt labour to attempt to prove, what every one is daily an eye-witneſs to. The preſent ſyſtem of politics, not only among princes and ſtates, but in ſmall communities, and among individuals too, is not only to make the greateſt advantages poſſible of the wants and diſtreſſes of others, but to create, as far as is practicable, thoſe wants and diſtreſſes, as the moſt certain and direct road to ſuch advantages. Hence, the accurſed thirſt of conqueſt, to feed the ambition of princes, and the atrocious ſpirit of monoplizing, to create ſcarcity in the midſt of plenty, to diſtreſs, perhaps, ten thouſand perſons in order to gratify the inſatiable avarice of one. Whoever may attend to the preſent ſyſtem of things, as actually exiſting in a populous, induſtrious, fertile country, where the eyes of every individual are open to private advantage, will ſoon ſee the neceſſity of reſtrictive laws, to protect the weak and innocent againſt the fraud and abuſe of thoſe, who make artifice and cunning their ſtudy, to impoveriſh and enſlave the reſt of mankind. This is an affair of the laſt importance, which, I am afraid, is very

far

far from being well underſtood. Some, I verily believe, from a generoſity of temper, and benevolence of diſpoſition, wiſh to ſee every means practiſed, which might probably reduce the price of commodities, eſpecially the neceſſaries and conveniences of life. To this end, it has been thought, that if the ports were thrown open, and the flux and reflux of the articles of commerce might be as free as the tides, it would neceſſarily occaſion plenty; and that this would as neceſſarily lower the price, which would be a convenience to all, and particularly, a great bleſſing to the induſtrious poor. This doctrine, plauſible as it may ſeem, from the humanity of the ſpirit by which it is dictated, I regard as a ſophiſm of the moſt dangerous kind. Nothing could ſooner reduce this country, to the deepeſt poverty and diſtreſs.

What is it, that has raiſed this country to the ſtate of affluence, eaſe, and happineſs, it has long enjoyed? Not the natural fecundity of its lands: for, in that reſpect, it is very far inferior to many other countries. Neither our lands, their natural produce, nor the populouſneſs of the country, could add one grain to its riches, without the induſtry and labour of its people: I mean thoſe, who not only labour for their maintenance and ſupport, but alſo, for the neceſſaries and conveniences of thoſe, whoſe circumſtances enable them to pay for what they are unable or unwilling to provide for themſelves.

themſelves. It is the well-directed induſtry of the labouring poor, which conſtitutes the riches of a country. They are, when beneficially employed, the true ſinews of its proſperity; to promote and effect which, is the heighth of political wiſdom. Numbers, unleſs uſefully employed, are the bane and curſe of every community.

Nature, in the moſt fertile ſoil, and climate, can only provide the rough materials; it is the induſtrious and laborious man, who cultivates the earth, reaps the grain, ſhears the flock, fabricates the cloth, fells the timber, penetrates into the bowels of the earth, and navigates the ſeas. Upon the unremitting toil of theſe laborious people, do the riches, the proſperity, and the happineſs of every populous country depend. A populous country, deſtitute of employment for its people, would ſoon exhibit a dreadful ſcene of wretchedneſs and miſery. A people, enervated and diſpirited for want of employment, and the means of a comfortable ſubſiſtence, to be procured by it alone, would ſoon become the ſcourge and curſe of a country.

But let us make the experiment; like fighting a battle, it will be much more ſafe to do it on paper, than in the field. I am very far from pretending to have a perfect, or even a comprehenſive view of the ſubject; but, I hope, without vanity it may be ſaid, I have a practical knowledge of commerce, ſufficient to enable

enable me to point out the inevitable ruin, that muſt attend the ſyſtem of eſtabliſhing free ports, for the importation and exportation of all kinds of commodities without reſtriction.

I will beg leave to premiſe a few propoſitions relative to this ſubject, the certainty of which, I perſuade myſelf, will not be diſputed.

1. If the labour and induſtry of a people are the ſources of the riches they poſſeſs, theſe ſources muſt dry up or abate, in proportion as the people want employment.

2. Both the land, and labour of *England* are very high, in compariſon with thoſe of almoſt any other country in Europe; conſequently, ſuch countries can under-ſell *England*, *cæteris paribus*, both in corn and manufactures, in any market in the world.

3. The produce of the earth, in its natural ſtate, and raw materials of all kinds, have their value exceedingly increaſed, by the ſkill and labour beſtowed upon them, in converting them into goods and wares, often in the proportion of, from five to twenty for one, and ſometimes a great deal more: therefore, where there are people to be employed, and ſuch goods and wares can be vended with advantage, it is extremely bad policy, to ſuffer the raw materials to be exported, on any pretence whatſoever.

4. Moſt countries have ſome advantages peculiar to them, ariſing from the ſoil, climate,

ſituation, or natural productions of the ſame. The genuine and moſt warrantable policy of any country is, to accommodate ſuch advantages to the good, the well-being, and proſperity of its people. Indeed, general policy renders it neceſſary, to put every ſtate upon an equal footing with its neighbours; for it would be deemed weakneſs or madneſs, to neglect local advantages, when every ſtate, and every individual around us, were availing themſelves to the utmoſt of their power, to profit by them.

5. If the exportation of raw materials is ſo impolitic a meaſure; how much more ſo is it, to encourage the manufactures of other nations, when they ſtand in competition with our own, and have a direct tendency to ſupplant us in our market at home, and in the conſumption of our own manufactures, though infinitely better accommodated to the uncertain climate of *Great Britain?* This is moſt unpatriotic, and, to the laſt degree, culpable.

Now, ſheep's wool is one of thoſe peculiar local bleſſings, with which *Great Britain* and *Ireland* are favoured, beyond any other part of *Europe*. Its quality is ſuch, that every ounce of it is capable of being wrought into uſeful clothing of ſome kind, which, it ſeems, is a rare and ſingular caſe. The value of wool, when wrought into cloth, upon an average, is reckoned to be in the proportion of, five or ſix to one.

one. The number of inhabitants is ſaid to be ſomewhere from ſix to ſeven millions, and that one third of theſe are ſaid to be employed and maintained by this manufacture. The proportion ſeems large; perhaps they are over-rated. Suppoſe only a ſixth of the people to be employed in this branch, the object is important, ſo much ſo, that the wiſdom of the legiſlature has always thought it neceſſary to encourage this manufacture by every means in its power. The queſtion, it ſeems, is—"Have they judged and acted rightly?" The grazier, perhaps, will tell you, no; for if he were permitted to export his wool, he could ſell it at double the price. This is very true, and would certainly be a great preſent advantage to him: but how long would it continue to be ſo? That, perhaps, he never thought of, nor of other conſequences, which would certainly overbalance even his partial advantages.

If it be true, as it is generally believed, that one pack of *Engliſh* wool enables the *French* to work up two packs of theirs; and if labour in *France* is cheaper, by, at leaſt, one half, than in *England*, they could afford to give a ſhilling for a pound of wool, that is now ſold for ſixpence, and ſell their cloth at little more than half the price—ſay two thirds at moſt—that an *Engliſh* manufacturer could do. Where, then, muſt we ſend our cloth to market?

But it has been ſaid—If the *French* would give us a double price for our wool, and ſupply us with cloth equally good, at two thirds of what we give for it now, that is, as good ſuperfine cloth for twelve ſhillings a yard as what we pay eighteen ſhillings for now, and ſo for other ſorts in proportion, is it not evident we ſhould be very great gainers by the bargain? I anſwer: labour and toil are generally the effects of neceſſity, and not of choice. Few men would be at the pains of doing any diſagreeable labour for themſelves and families, if they had any ſure means of doing as well, or better, without it: but what muſt the man do, who is deſtitute of ſuch means? If he ſhould ſell his pound of wool to T. for a ſhilling, which E. would only give him ſix-pence for, would that enable him to give twelve ſhillings, or ſix ſhillings, to T. for a yard of their cloth? This is the true queſtion; for at leaſt nine-tenths of the people, perhaps ninety-nine out of a hundred, muſt earn their bread, and cloaths too, by their labour. It is not the caſe of the woollen manufactures only, but of almoſt all manufacturers and artificers whatever. It has been ſaid, if that branch fail, let them betake themſelves to ſome other! I ſhould be happy to ſee the man, who could point out the means of employing a million of people beneficially, in any other branch whatever.

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The linen manufacture comes the neareſt to the woollen: and the weaver of the latter, might ſoon be brought to weave the former. But here you are under a ſimilar dilemma: for not a piece could be made in *Great Britain* without great loſs, if foreign linens were not ſubject to cuſtoms, almoſt equal to a prohibition. The linens of *Sileſia*, *Pomerania*, *Saxony*, *Poland*, *Ruſſia*, *Flanders*, and *Holland*, pay cuſtoms from eighteen to thirty, and upwards, per cent.; and thoſe of *France* are prohibited. If you turn to the ſilk manufacture, you are there protected and encouraged by ſimilar means. *French* ſilks are abſolutely prohibited: thoſe of *Italy* pay too heavy a duty to be worn in common: the *Eaſt Indian* are prohibited under very ſevere penalties. Were it not for very heavy duties, and prohibitions, not a piece of any of theſe goods could be made here.

Where then, ſhall we find employment for ſo many millions of people, who, upon the ſcheme of a free trade and open ports, would be deprived of their uſual means of ſubſiſtence? Our manufactures of lace are upon the ſame footing: black and blond ſilk laces are prohibited: thread lace pays a duty, upon low goods, of four or five hundred per cent. The ſmall wares of *Harlem* are under the ſame predicament. Filletings, tapes, bobbins, threads of all kinds and denominations, pay duties from twenty to

thirty per cent. and ſome much more; and, notwithſtanding all this, the *Engliſh* manufacturer is often puzzled to ſell goods in our market at home, upon terms equally low with the foreign manufacturer.

From hence it is eaſy to ſee, that the laws of this country, reſpecting commerce, are abſolutely neceſſary to its very exiſtence. Repeal the laws, open the ports, and invite all the world to a free correſpondence with you, and you, at one ſtroke, deprive millions of people of the means of ſubſiſtence. What will you do with them then? Maintain them you cannot: for the whole income of the lands bears but a ſmall proportion to the amount of the produce of their labour. The plain anſwer is—Many would be hanged, more would be ſtarved, and many more would emigrate into other countries, as they did formerly into this, in hopes of employment.

The grazier, by this time too, would begin to feel the effects of his error: for having no market to go to, but *France*, with his wool, and that being glutted, it is more than probable, he would fall ſhort of the price he now ſo much complains of at home. For wool, and corn, and all commodities whatever, are ſubject to, and governed by the ſame law. Every man, and every ſtate, that is in want of any articles whatever, are ready to buy at a fair price: but

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the ſeller muſt ſubmit to very diſadvantageous terms, to prevail upon the buyer to purchaſe a commodity, he has no occaſion for, and knows not what to do with.

I would beg leave juſt to mention, by way of illuſtration, that the grazier is now under the very ſame predicament, that the farmer was near one hundred years ago. Wheat was then at little more than three ſhillings a buſhel; exportation was encouraged by a bounty to enhance its price. The experiment ſucceeded, as it infallibly muſt; and the very next year it was nearly double. The grazier's hopes are equally well founded. Were he permitted to export his wool, the price would immediately advance, not only for exportation, but for home conſumption too; and were it not for the ruinous effects I have deſcribed, the meaſure would certainly be juſt and politic. But if the price hereafter ſhould, by any means, fall a penny or two pence a pound below what it is now, is it poſſible to conceive, that this circumſtance could encourage the grazier to inceaſe the quantity; or can we reconcile it to common ſenſe, that a circumſtance happening to a man, in any profeſſion, by which he is a ſufferer to a very conſiderable amount, ſhould animate him to extend and increaſe his trade? Yet this is the very argument uſed by the advocates of the bounty. A bounty, ſay they, encouraged exportation; exportation

encouraged the farmer to plant; and planting lowered the price; the price is, therefore, lower than it was before the bounty took place; the fall of price is owing to the bounty; *ergo*, the fall of price encouraged the farmer to plant more corn! But this is a ſophiſm, as dangerous as it is abſurd.

Were it true, that the average price of wheat has been cheaper ſince the bounty than it was before, it is clearly demonſtrable, that could not be the cauſe. From 1730 to 1750, there were twenty ſuch years of plenty as were never known; conſequently, the average price of thoſe years was lower than was ever known before or ſince. But it ſeems to have been forgotten, how neceſſarily and how largely the price muſt have been affected, by the great improvements which have been made in agriculture during the laſt century. Clover, turnips, and potatoes, are ſuch an acquiſition, as ultimately, by means of general improvement, affects the price of *all* the produce of a farm. Potatoes alone contribute, in moſt families, to leſſen the conſumption of bread; and in dear times, in ſeveral counties, among the poor, they almoſt totally ſupply the uſe of it. It ſcarcely admits a doubt, that this uſeful root alone has lowered the average price of wheat, at leaſt ſix-pence a buſhel.

What has occaſioned the loud outcry of the fall of price in coarſe wool? The very ſame

cauſe,

cauſe, that would have lowered the price of corn, if exportation had not kept it up—that is—IMPROVEMENTS. In countries which have been drained, the lands incloſed, and the turnip-culture adopted, the paſture has been amazingly increaſed, and the ſize of the ſheep alſo: ſo that a double quantity of wool has been raiſed upon the ſame extent of land, and the grazier would be no ſufferer, though he ſhould ſell for half the former price: for the loſs in quality is more than compenſated by the increaſe in quantity.

*On*

## *On the* Natural History *of the* Cow, *so far as it relates to its giving* Milk, *particularly for the* Use *of* Man. *By* C. White, Esq. F. R. S. *&c. Read March* 12, 1783.

NATURALISTS seem to lay it down as a general principle, that neither animals, nor parts of animals, are primarily intended for the use of man, but are only capable of a secondary application to his purposes. It must, however, be allowed that, in many instances, the secondary use is so manifest and important, that it cannot, with propriety, be excluded from the original designs of the all-wise Creator. And it appears to me, that the *Cow* in its faculty, of giving in such abundance, and with so much ease, its *Milk*, which forms so excellent an article of aliment for the human species, is a striking example of this subordination to the interests of mankind. For this animal differs in some parts of its organization from most others, having a larger and more capacious udder, and longer and thicker teats, than the largest animal we know; and she has four teats, whilst all other animals of the same nature, have but two.

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She alſo yields the milk freely to the hand, whilſt moſt animals, at leaſt thoſe that do not ruminate in the ſame manner, refuſe it, except their own young, or ſome adopted animal be allowed to partake.

This is a ſubject which, one would have thought, had long ſince been exhauſted; but I have not been able to find any thing ſatisfactory in the few authors I have read. I muſt confeſs, indeed, that my knowledge in Natural Hiſtory is very confined, and ſhould therefore wiſh to hear the ſentiments of thoſe learned Members of this Society, who have made the hiſtory of nature their more particular ſtudy.

In the firſt place, the Cow is of that claſs of *horned ruminating animals*, which have *cloven hoofs*, *four ſtomachs*, a *conſiderable length of inteſtines*, are furniſhed *with ſuet*, and have *no dentes inciſores in the upper jaw*. From the different ſtructure of the ſtomach in theſe creatures, a ruminant animal will be ſerved with one-third leſs food, than another of equal bulk. Graziers are ſufficiently acquainted with this. The reaſon is, that ruminating animals have many and ſtrong digeſtive organs; and every thing capable of being converted into chyle, is extracted from the food; which therefore yields a greater quantity of milk: but a horſe's and an aſs's ſtomach is not fitted for this; ſo that they require a much

a much greater quantity of food to extract the ſame nouriſhment.

A Cow's udder is ſo capacious, that it frequently contains ten quarts of milk, which it will yield twice a day; and it is not only remarkable for its quantity, but its quality, as ſome cows will afford twelve or fourteen pounds of butter in a week. The ſize and form of the teats appear, at the firſt ſight, as if they were made on purpoſe for the hand to draw off the milk. But this is not the only advantage they poſſeſs; the thickneſs permits the lactiferous tubes to be of a larger diameter, and the length of them makes the ſyphon ſo much longer, and the extraction of the milk of courſe ſo much more eaſy.

The cow having four teats is a ſtriking peculiarity, the number in all other animals, bearing ſome proportion to the number of young ones, they bring forth at a time, as in the bitch, the cat, the ſow, &c. But the Cow does not bring forth, at a birth, more young ones, than thoſe animals who have but two teats.

The Cow will yield her milk to the hand as freely, and will continue to give her milk for as long a time, without any calf coming near her, as if it were permitted to ſuck her conſtantly. This is not the caſe with the aſs, which, next to the Cow, is the animal we are moſt accuſtomed to have milked in this part of the world,

world. For it is well known, that an aſs will ſoon grow dry, if her foal is not permitted to ſuck part of the milk every day, but ſhe is not a ruminating animal.

The human milk cannot long be preſerved in the breaſts, without the child be permitted to ſuck. It otherwiſe ſoon acquires a bad ſaltiſh taſte, and, in a ſhort time, leaves them entirely; and this will happen, if the child alone ſucks, if it be not permitted to ſuck four or five times a day. Three times a day I find is, in general, not ſufficient to keep the milk good, and in proper quantity. I do not mean to ſay, that it is impoſſible, in any ſubject whatever, to keep the milk without a child ſucking conſtantly. I believe there have been inſtances of ſuction by perſons, above the age of infancy, and even by puppies, keeping the milk for ſome time; but theſe may, in ſome meaſure, be conſidered in the light of adopted children. What I would wiſh to enforce is, that the moſt dexterous and moſt ſkilful women, who draw breaſts, do not keep the milk without the aſſiſtance of the child; and when I have particularly deſired them to do it, they have not been able, though they have ſwallowed the milk, and repeated the ſuction four or five times a day.

Capivaccius, it is ſaid, ſaved the only heir of a noble family by ordering him to lie between two

two nurſes, in the flower of their age, and ſuck their breaſts.

Foreſtus tells us, that a youth at Bologna, of twenty-nine years of age, labouring under a true maraſmus, lived upon the milk of a beautiful young nurſe, of eighteen years of age, who lay in the ſame bed with him, by which means his emaciated body was well reſtored. In both theſe inſtances, I ſuppoſe the milk was preſerved, without the child being permitted to ſuck. I am informed that goats, ſheep, and rein deer will give milk freely to the hand, without the kid, lamb, and the fawn having acceſs to them, but they are ruminating animals of the ſame kind with the Cow.

Upon the whole, I believe we may infer, that the property of yielding milk, without the young one, or ſome adopted animal, in ſome meaſure partaking of it, is confined to that claſs of *ruminating horned animals* who have *cloven hoofs*, *four ſtomachs*, *long inteſtines*, are furniſhed with *ſuet*, and have no *foreteeth in the upper jaw*. That cows, ſheep, goats and deer are of this kind, and no others; and that the Cow has this property in a more eminent degree than the others, owing to the capaciouſneſs of her udder, and the ſize, form and number of her teats. There are other ruminant animals, beſides thoſe

I have

I have mentioned, ſome of which are without horns or cloven feet, and without ſuet; ſome have only two, ſome three ſtomachs, and ſome are furniſhed with fore-teeth in the upper jaw; but I cannot learn that any of theſe are poſſeſſed of the property I have mentioned.

It may, perhaps, be ſaid, that the Tartars ride mares, upon their excurſions for plunder, in order to live upon the milk, and probably do not take their foals with them. But this will not diſprove the doctrine I have advanced; as the milk will hardly deſert them in ſo ſhort a time, as one of theſe excurſions might laſt.

Is there not, therefore, ſome reaſon to conclude that the Cow was, by the omniſcient Author of nature, intended to give milk, particularly for the uſe of man?

## *On the* NATURAL HISTORY *and* ORIGIN *of* MAGNESIAN EARTH, *particularly as connected with those of* SEA SALT, *and of* NITRE; *with* OBSERVATIONS *on some of the* CHEMICAL PROPERTIES *of that* EARTH, *which have been, hitherto, either unknown, or undetermined. By* THOMAS HENRY, F. R. S. *&c.*

NATURALISTS and Chemists formerly divided the different kinds of earths into five genera, viz. the Siliceous, or Vitrifiable, the Calcareous, the Gypseous, the Argillaceous and the Talcky. But recent discoveries having proved the Gypseous, to be a compound of Calcareous earth and vitriolic acid, and the Talcky, to consist of a mixture of Argillaceous with other earths, the genera were reduced to three. M. Baumé has even attempted a farther reduction; * and has endeavoured to prove, that two of these are merely modifications of the other: argillaceous earth being, according to him, a vitriolic salt,

* Baumé, Chymie Experimentale et Rationêe, vol I. *sur la Terre.*

formed

formed by the union of vitriolic acid with siliceous earth; and the calcareous, a combination of the same earth, with certain portions of air and water, effected by the operation of various marine animals: and he supposes, that when calcareous earth is deprived of air and water, it will return to its primitive state, viz. that of siliceous earth.

This theory is, perhaps, rather fanciful, than just. The operations of Nature, it must be allowed, are generally simple—but we may simplefy too far; and, in forming systems, we should not suffer our imaginations to carry us beyond those bounds, which our senses, and experiment, warrant.

Calcareous earth, indeed, in the form in which we commonly find it, is a compound, consisting of earth, air, and water; and is not considered as *pure*, till it be deprived, by fire, of the two last elements. It is then, properly, *pure calcareous earth*; but it does not appear that longer calcination, though it may divest it of some of the properties of *calcareous*, will ever reduce it to the nature of *siliceous* earth.

Every earth with which we meet, and which, when separated from those acids, or other accidental bodies, that are combined with it, resists every power we possess, to produce any farther decomposition, and yet differs in all, or any of its properties, from the other known

earths, may be admitted to form a new genus. And, on these grounds, two new genera have lately been added to the other three. The basis of some spars,* which had been generally deemed to be calcareous earth, has been proved to differ from it, in its affinities and some other properties; and has been admitted to form a distinct genus, under the title of *Barytic* or *Ponderous* Earth: and another kind of earth, which though rarely, if ever, found pure in nature, yet abounds, in great quantities, in various forms of combination, from which it may be separated by chemical means, has been allowed to form a fifth genus, under the appellation of *Muriatic*, or, *Magnesian* Earth.

This earth was also, for some time, confounded with calcareous earth, of which it was supposed to be a modification; for by the earlier modes of obtaining it, it was mixed with such

* 1. Marmor Metallicum, *Cronst.* 182. Gypsum Spathosum, Spathum Fusibile, *Margraf.* &c. Terra ponderosa vitriolata. *Bergman. Sciagraphia* Ponderous Spar.

2. Marmor Metallicum, *Cronstedt Min.* § 18. B. Calk or Cauk.

3. Gypsum crystallisatum capillare, *Cronstedt. Min.* § 19. B. Radiated Cauk.

4. This earth has been also found of a sparry appearance, and combined with aërial acid only; *Terra ponderosa aërata.* See Dr. Withering's *Experiments and Observations on the* Terra Ponderosa. Phil. Trans. vol LXXIV. p. 293.

a quantity

a quantity of calcareous matter as to disguise its distinguishing features, and even make it assume some of the characteristics of calcareous earth. But the accurate experiments of Messrs. Black and Margraaf, soon removed the obstacles, which impeded our more perfect acquaintance with its nature, and they procured it pure from the mixture of other earths; in which state they found it so different, from what it had been represented, that it was declared to be an earth, *sui generis*. But though Dr. Black went thus far, he did not proceed to set it at the head of a distinct genus; but placed it, with all those earths, which he has classed together, under the general generic head of *Absorbent Earths*, of which he was content to make this a species. It has since obtained a more honourable rank, and forms a separate genus.

M. Fourcroy, who follows the arrangement of his predecessor M. Bouquet, has placed calcareous, ponderous, and magnesian earths among the salts. There should seem to be strong objections to this arrangement, even with respect to the two former; though *their* being sapid, and soluble in water, may give some countenance to it. But the insipidity and total insolubility of *pure* magnesia, together with its not being fusible, by the strongest heat we can apply, as will presently be shewn, are proofs of its being a real earth.

Though magneſian earth is rarely found pure, in nature, it is contained, in a ſaline form, in all nitre heaps, from the mother ley of which ſalt, it was formerly extracted; in the water of ſeveral medicinal ſprings, and even in our common wells. But the ſea is the great ſource from which we obtain it; in the waters of which, it is united to the marine acid, in which form it remains, after the cryſtalliſation of the ſea ſalt, and is afterwards ſeparated from the marine, and united to the vitriolic, acid, by a particular proceſs. It is then called *Sal Catharticus Amarus*, and, from this ſalt, the magneſian earth may be precipitated. One hundred parts of the ſalt yield, on precipitation by a mild alkali, forty-two of magneſia, united with aërial acid. If a cauſtic alkali be employed, the product amounts to only twenty-five parts. But a portion of this laſt may be driven off by calcination, and conſiſts of water, and, perhaps, *ſome* aërial acid, for it is difficult to procure the alkali quite free from that gas. The Magneſia is then ſaid to be *pure*. One hundred parts of ſal catharticus amarus contain only nineteen of *pure* Magneſia, and according to Bergman, thirty-three of vitriolic acid, and forty-eight of water. But Mr. Kirwan, who reckons only on the *real* acid, makes the proportion of acid twenty-four, and of water fifty-ſeven, parts.

Sir

Sir. T. Bergman relates,* that he procured a salt, similar to the sal catharticus amarus, by lixiviating the earthy matters, separated by washing from the silver ore of Sahlberg, on the surface of which the salt forms, by exposure to the air. One hundred weight of the earth yielded sixty-five pounds of this salt. M. Monnet, also, discovered a kind of Schistus, which on calcination, and lixiviation, furnished a small portion of the same salt.

Magnesian earth may also be separated, by means of vitriolic acid, from some spars, marbles, and other earthy and stony bodies of which it forms a component part.

The compound spar, described by Mr. Woulfe,† contains, in 100 parts, 60 of mild calcareous, 35 of mild Magnesia, and 5 of iron.

One hundred parts of Creutzenwald stone contain 12 of mild Magnesia.

The *Kolmord marble*, the *Pietra Talchina*, the *Verde Antico*, and the *Griotte*, a red marble from *Autun*, all contain small portions of Magnesia.

The *Spuma Maris*, an earthy substance, from which the Turkey tobacco-pipes are made, is said to consist of equal parts of magnesian, and siliceous, earths.

* Bergman de Magnesia.

† Phil. Trans. vol. LXIX. p. 29.

Steatite, or Soap-rock, contains, according to Sir T. Bergman, 17 of mild Magneſia in 100 parts of that compound.

A looſe earth, found in Sileſia, and deſcribed by Margraaf, contains $\frac{1}{3}$ of its weight of Magneſia.

Fibrous Aſbeſtos contains, in 100 parts, from 12 to 28, and, Coriaceous Aſbeſtos, from 22 to 26 parts of magneſian earth, united to aërial acid. Amianthus affords 18, 6, Lapis Nephriticus 33, and Venetian Talc, an undetermined number of parts of the ſame earth.

*Colourleſs Mica* affords, on analyſis, 20 parts, in 100, *blue Schiſtus* 8, *black Hornſtone* 16, and *Killas* 6 parts of Magneſia.

Magneſia is alſo contained, in ſmall quantity, in Chryſopathium, Felt-Spar, Schoerl, and Baſaltes: and Pumice-ſtone yields of it, from 6 to 15 parts in 100.

A martial muriatic ſpar, found by *M. Monnet*, at St. *Marie aux Mines*, and, by him, named *Piſolites*, is conſtituted of 50 parts of Silex, the remaining parts conſiſting of mild Magneſia and Iron, the proportions of which are not determined. *

Such are the compounds under which magneſian earth is principally found; and I have

* Vide Kirwan's Elements of Mineralogy, paſſim.

collected

collected them under one view, as it may be useful to some artists, particularly those concerned in the potteries, to know what earths and stones contain it, and in what proportions. Magnesia, as prepared for the shops, would be too expensive for the purposes of manufactures, which may perhaps, often, be equally answered by using it in these combined forms.

It may seem extraordinary, that a substance, so plentifully diffused in a state of combination, should so rarely occur pure.* But the case is the same, as the celebrated Bergman has observed, with Clay, which is always found, in nature, combined with other substances.† Siliceous earth is indeed, sometimes, found *pure* in the form of *Rock Crystal*; but Bergman detected small portions of both argillaceous and calcareous earth, in the specimens which he examined. Ponderous earth is generally combined with vitriolic acid, and the most pure state, in which it has been observed, is its combination with aërial

* I have been assured by Mr. Fabroni, that Magnesia has been found pure, in the Pyrenees. This, however, was, probably, not *pure*, in the present acceptation of the term; but pure from any other admixture, than that of aërial acid, for which magnesian earth has a strong attraction.

† Clay, commonly so called, does not, in general, contain more than from twenty-five to forty-eight parts, in one hundred of pure argillaceous earth.

acid. Calcareous earth has indeed been diſcovered, in the neighbourhood of Bath, in the ſtate of quicklime, though, probably, not wholly diveſted of aërial acid. But they are all more frequently found combined with other ſubſtances, forming ſaline compounds, or, one or more, mechanically mixed with each other, conſtituting ſpecies and varieties.

The late Dr. Lewis, has conſidered the earth which is obtained from vegetables, after incineration, and waſhing, as of the ſame nature with Magneſia: and if we endeavour to trace the origin of magneſian earth, it may appear not improbable that, as all calcareous earth is the reſult of the deſtruction of teſtaceous animals, ſo the magneſian ariſes from vegetables, which have periſhed, and undergone ſome proceſs in the great laboratory of nature; whereby they are reduced to this ſtate. By putrefaction they are altered to a fine black Mold. And it may be that, Nature, who often operates by ſlow and ſecret ſteps, may make ſuch further changes, as to convert this Mold into magneſian earth.

But the origin of magneſian earth is ſo connected with that of ſea ſalt, which it always accompanies, that it may not be improper to conſider them together; as it is probable that they are both formed under ſimilar circumſtances, and at the ſame time.

Philoſophers

Philoſophers have been much puzzled to account for the original ſaltneſs of the Sea. Some have imagined it muſt have been furniſhed by rivers, which flowing from the land, conveyed with them ſuch quantities of ſalt, from accumulations of that mineral, formed within the bowels of the earth, as to communicate, and continually ſupply ſaltneſs to the Sea; while others have attributed its impregnation to rocks of ſalt, ſituated at the bottom of the Ocean. To both theſe opinions, objections have been made; and the learned Biſhop of Landaff,* has choſen to adopt another, viz. that the Sea was *originally created* ſalt. In ſupport of this theory, and in objection to the others, eſpecially to that which aſſerts the origin and ſupply from the land, it has been advanced, that a great part of the finny inhabitants of the ocean cannot exiſt in freſh water, and therefore it is not to be ſuppoſed, that they ſhould ever have been placed in a ſituation unſuited for their ſupport. It might alſo have been added, that, there is as much difficulty in accounting for the origin of the ſalt, which the rivers are ſuppoſed to waſh down, as for its formation in the Sea. But might not the great Creator, by whoſe FIAT all things were produced, accommodate the firſt inhabitants of the Sea to their temporary

* Watſon's Chemical Eſſays, vol. II.

ſituation;

ſituation; and gradually produce ſuch changes in their conſtitutions, as to make the ſaltneſs of the water neceſſary to their ſupport? Changes, equally great, appear to have taken place in the human habit. The duration of life, in particular, was protracted, in the earlier ages, to a length convenient for the ſpeedy population of the world; and when that end was accompliſhed to a certain degree, Providence aſſigned limits to the exiſtence of mankind, at the utmoſt of which we ſeldom arrive, and beyond which we never paſs.

Notwithſtanding what I have here advanced, I muſt confeſs myſelf inclined to join in the opinion, that the Sea was originally created ſalt. But all ſaline ſubſtances, with which we are acquainted, are ſubject to gradual decay, decompoſition, or volatilization, in long proceſs of time, and when expoſed to the action of air, moiſture and heat. Nature has eſtabliſhed an univerſal ſyſtem of alternate deſtruction and recompoſition in her works; and is continually carrying on proceſſes in her grand laboratory, which art is unable to imitate. Animals and vegetables periſh and decay; and, when corrupted, contribute to the ſupport or accommodation of each other; and many mineral ſubſtances, though more permanent than thoſe which conſtitute the other kingdoms, are liable

to

to considerable changes, are frequently decomposed, and forced to enter into new combinations. It is not therefore to be supposed, that the same individual sale has been contained by the ocean, from the creation to the present time. We know that the waters are continually evaporating into the atmosphere, forming clouds, descending again in rain, replenishing the earth, and after forming rivers, returning to the sea. Sea salt rises, by a moderate heat, with the vapour of water, and is often carried by storms to considerable distances. By these and other means, it is probable, there must be a continual waste of salt, which Nature must have some mode to supply.

The ocean is replete with animals and plants. The destruction and corruption of these must furnish much matter, fitted for the formation of saline substances, much earth, much of the principle of inflammability, and of air; and, if water were not a part of their composition, the sea would plentifully supply that elementary ingredient. By the putrefaction of similar substances, mixed with calcareous earth, moistened with water, and exposed to the gradual action of the air, Nitre is formed. May not the same substances, under different circumstances, covered by the depth of the ocean, and separated hereby from immediate communication with the air, produce Sea-Salt. It has lately been discovered

diſcovered, by an ingenious chemiſt,* that though Nitre is produced by the above ſubſtances, with the acceſs of air, yet if they be ſo placed that the air may be excluded, and the ſituation perhaps not too moiſt, Sulphur, and not Nitre, is the reſult. So that the three mineral acids ſhould ſeem to have a ſimilar origin, and it is not without good grounds, that they are ſaid to be modifications of each other.

But it may be ſaid, that the analogy in the production of Sea-Salt and of Nitre is not complete. That, in the one, both the alkaline and acid parts of the ſalt are formed; whereas, in the other, the acid only is produced in the beds, and it is neceſſary to add an alkaline ſalt to conſtitute the baſis of the Nitre. I cannot however allow of the force of this objection. Though the addition of the alkali be neceſſary, in theſe northern latitudes, yet, in warmer climates, where Nature is more vigorous and active, there is no doubt but ſhe forms, or devellopes, both the acid and alkali of Nitre, at the ſame time.

* M. Fougeroux. vide Memoirs del'Academie Royale des Sciences pour l'année 1780.

The Sulphur, produced under the above circumſtances, was found, amidſt the ruins of an old houſe which had been built in a very filthy place, contained in a maſs of earth, and, in part cryſtallized; and conſtituting, in ſeveral of the large portions of the earth, a third of the whole maſs.

To

To the evidence adduced by Dr. Wall, in his ingenious paper, on the origin of the Fixed Vegetable Alkali, and of Nitre, I have to add that of Baron Dillon, the intelligent translator of Mr. Bowles's Travels in Spain, who has, personally, assured me of the authenticity of the fact; and of a Gentleman who resided, during several years, in the East Indies, as superintendent of the manufactures of the Company, and fully confirms the account, that Nitre is procured, from the soil of certain places in that country, merely by lixiviating it, and evaporating the water, without the addition of any alkaline salt. The Duke de Rouchefoucauld also obtained one ounce of nitre in the pound, from chalk of Roche Guyon: and it is said, by M. Fourcroy, to be found quite pure in chalk beds.

Indeed the relation between the production of these two salts is very striking; for at the same time that Nitre is formed in the beds, a considerable quantity of Common Salt seems to be produced; and, during the evaporation of the nitrous ley, such quantities of it are separated, that we cannot suppose the whole to have pre-existed, as such, in the urine and other animal matters, used in the nitre heaps, but must regard it, in some measure, as a new product.

Nor does the analogy stop here. Together with the Nitre, which is formed in the beds, and with the Sea-Salt, which we suppose to be formed

formed in the ocean, another ſalt conſiſting of marine acid and magneſian earth, is always produced, or, at leaſt, is always found mixed with theſe, and is left in the mother ley, remaining after their cryſtalliſation. It ſhould ſeem, therefore, highly probable, that Nature, at one and the ſame time, fabricates from the conſtituent parts of animal and vegetable ſubſtances, not only the alkaline and acid ſalts, but the mild and taſteleſs earth of Magneſia—and that this earth is the reſult of the decompoſition of vegetables, whoſe other component parts, combining with animal matters with which they meet, and aided by the concurrence of air, water, and heat, conſtitute the different acids and alkalis, neceſſary to the formation of Sea-Salt and of Nitre. *

Meſſrs.

* M. Baumé is of opinion that the conſtituent parts of fixed alkaline ſalt, are calcareous earth, water, and phlogiſton: and he aſſerts that he has produced this ſalt, by calcining together equal portions of powdered marble, and the charcoal of oil of hartſhorn; and that the quantity of ſalt was always diminiſhed by a diminution of the inflammable matter, employed in the experiment. He attempts to account for the formation of ſaline ſubſtances, in the humid way, in the following manner. "Les teſtacées croiſſent et periſſent dans la mer. La Nature, par le movement des eaux, briſe et reduit en poudre impalpable beaucoup de coquilles de ces animaux, et met la terre calcaire en etat d'être diſſoute par l'eau. L'eau

de

Messrs. Black and Margraaf, and particularly the former, have thrown great light on the Chemical History of Magnesian Earth. The Essay of the former, in particular relates a number of experiments made in the most accurate manner, and of deductions the most clear and satisfactory, of any treatise extant. An essay the more valuable, as besides the discrimination of that earth from the Calcareous, it has laid the foundation of the many valuable discoveries relative to the nature of fixed air and the various Gases, which have been the sources of the most valuable improvements in Chemistry. Happy I must esteem myself if, following such great masters, I have been able to add any new or useful information.*

The

de la mer dissout de même la matiere inflammable, non seulement des corps dont nous parlons, mais de tous les corps organisés qui croissent et perissent dans son sein: elle elabore à son gré la matiere inflammable, et la reduit dans la etat convenable pour former différentes matieres salines. De cette union il résulte différentes sels, suivant l'etat des substances, et les proportions dans lesquelles ces substances se sont combinées. Je pense que les sels contenant de l'acide vitriolique et ceux contenant de l'acide marin, sont les sels que la nature forme le plus abondamment dans la mer; ils sont, l'un et l'autre, des sels primtifs. Chymie Experimentale et Raisonnée vol. I. p. 205.

* The principal improvements, which I ventured to suggest, in Dr. Black's process for preparing Magnesia Alba; those, I mean of employing a larger quantity of water,

The late Sir Torbern Bergman has purſued the ſubject with great ſucceſs. He has ſatisfactorily explained ſome of the phenomena of the proceſs for the preparation of Magneſia; has aſcertained its affinities with all the acids, to many of which Dr. Black had not extended his inquiry, and deſcribed the Salts formed by their union with this baſis. And he has given an account of the reſult of various experiments, made with a view of determining the degrees of fuſibility, which Magneſian Earth exhibits, when expoſed to a ſtrong heat, either mixed with other earths, or *per ſe*.*

water, for the firſt waſhing, and of throwing the mixture, of the Saline Liquors, into boiling water, and continuing the coction, inſtead of boiling the mixture, previous to the addition of the water, have been adopted, in the later editions of the Edinburgh Pharmacopœia.

* This excellent Chemiſt has done me the honour to quote my diſcoveries relative to the difference of the ſepticity of Magneſia Alba, when applied to fleſh and to bile; and ſubjoined my name in a marginal note to the paſſage. He then proceeds, in the next paragraph, to cite the antiſeptic properties in both caſes of Calcined Magneſia, and its power of rendering reſinous ſubſtances ſoluble in water, in which paſſage he has uſed my own words. Yet M. Fourcroy, and after him, his tranſlator Mr. Elliot, have mentioned M. Bergman, only, as the relater of the latter facts, without noticing the author from whom he had taken them. My Eſſay was publiſhed in May, 1773, whereas the date of that of Sir Torbern Bergman, which like moſt of his other excellent Tracts, was written as a Theſis for one of his Pupils, is December 23, 1774.

Magneſia,

Magnesia, says M. Bergman, exposed to a long continued, and very violent fire, agglutinates and begins to shew signs of fusion, especially if the Magnesia has been prepared, by calcination, from the mother leys. Mon. Darcet, on the contrary, had averred, that the earthy basis of Epsom Salt resisted the action of a fire equal, in continuance and force to that of a Porcelain furnace. And M. Macquer, in the new edition of his Chemical Dictionary, declares, that he has exposed the Earth of this Salt to the greatest heat, that could be formed in the focus of M. de Trudaine's large lens, without the least appearance of a tendency to fusion. M. Morveau had operated on Magnesia separated from the mother ley of Nitre, and had concluded it to be, not only in itself, the most fusible of all earths, but that it even decided the fusion of other earths. But on making his experiments with Magnesia, precipitated from Epsom Salt, he found, that on separately exposing two Hessian crucibles, the one containing Chalk, and the other an equal portion of Magnesia, to the strongest degree of heat, that could be produced in M. Macquer's furnace, the chalk was fused into a beautiful transparent glass, and had attacked and dissolved the crucible, for more than half its thickness, wherever the Calcareous Earth had reached. But the Magnesia was formed into a round, white, opake, solid, mass, not having the appearance even of the semivitrification of

Porcelain, and without the leaſt adheſion to the crucible.*

This experiment ſeems to coincide with that of Bergman, but to differ, in ſome degree, from that related by Macquer. Mr. Magellan, whom we have very deſervedly-ranked among our honorary members, has lately favoured me with an account of ſome curious experiments, made in London, which may ſerve to clear up this point. I ſhall therefore comply with his requeſt to lay an extract of his letter before the Society; and then beg leave to add a few remarks on the ſubject, and on ſome other of the chemical properties of Magneſian Earth, which are either unknown or undecided.

" I have a fact," ſays Mr. Magellan, " to " relate, which may be agreeable to you, con- " cerning the portion of Calcined Magneſia you " favoured me with. On my return to London, " many experiments were making with a moſt " powerful burning lens, executed by Mr. " Parker. Among theſe, was a very ſtriking one, " which puzzled me much, made with Calcined " Magneſia, caked, by preſſure, into a cubic " form, of $\frac{1}{4}$ of quarter of an inch per ſide. " This, expoſed to the focus of the lens, was " reduced from $\frac{25}{100}$ to $\frac{8}{100}$ on each ſide of the " cube. On hearing this I was ſtruck with the " fact, which is contrary to the known property

* Opuſcules Chymiques et Phiſiques de M. T. Bergman, traduits par M. de Morveau, tome. I. p. 398.

" of

" of Magnesia, viz. of not changing its dimen-
" sions, nor receiving any alteration in its con-
" sistence, by the strongest heat. I therefore
" went, the first fair day, to the place where
" the lens was at work, carrying with me the
" very same bottle with which you favoured me.
" I made a similar cube of your Magnesia, with-
" in the same metallic box that had been used
" in the former case; but I found that, by ex-
" posing it, even for a longer time, to the force
" of the lens, than the other Magnesia had been,
" this of yours was not sensibly diminished in
" bulk, nor did it become harder, as the other
" had done, which must have had a considerable
" portion of Argillaceous or Siliceous Earth in
" its composition, to occasion it to shrink in
" such a manner. I was told it was bought of
" a very good and reputable Chemist. But, very
" probably, he may precipitate his Magnesia,
" with uncrystallised Tartar, or with any other
" Alkali, whereas Bergman prefers the vola-
" tile. Or, perhaps, crystallised Tartar has
" always some siliceous or other earthy sub-
" stance, which, mingling with the Magnesia,
" prevents its adhering to its specific character.
" I wish to know whether I am right in this way
" of accounting for the difference; for as I am
" now preparing for the press, a second edition
" of Cronstedt's Mineralogy, I wish the fact to
" appear in its true and proper light."—So far Mr. Magellan.

It is very probable that the Magneſia, uſed in the experiments of Meſſrs. Bergman and Morveau, was pure, as the former recommends, and the latter actually employed, the Volatile Alkali, to effect the precipitation of the earth. The difference, therefore, between their experiments and that of M. Macquer, moſt probably depended on the communication of ſome portion of Siliceous or Argillaceous Earth, from the crucible in which they were made. Whereas M. Macquer's experiments, being made in a metallic box, and the heat directed immediately to the Magneſia, no tendency to vitrification would appear.

In regard to the difference between the Magneſia, which was firſt expoſed to Mr. Parker's lens, and my own, I can only ſpeak from conjecture. I have been particularly careful to have my Alkaline Lixivium, which is a ſolution of the fineſt pot-aſh, perfectly purified: and have frequently obſerved, that after it has been freed from all Neutral Salts, and from all the earthy matter, that the filter could ſeparate, the ſolution, on long ſtanding, has become again turbid, and depoſited a copious white ſediment. Bergman, who deſcribes a ſimilar ſediment declares it to be Siliceous Earth, that had been held in ſolution by the Alkali, and is precipitated by the fixed air, attracted by the ſalt. This fact is adduced by him, as a proof

a proof of the acidity of that gas. Perhaps the ingenious Chemist, who prepared the other portion of Magnesia, not adverting to this circumstance, or justly not considering it as materially affecting the *medicinal* properties of the Magnesia, though it would greatly alter its *chemical* qualities, might have used his Lixivium, soon after filtration, and, by this means, the extraneous Earth might have been introduced into the Magnesia, and have affected its fusibility.

Dr. Black had said, in his excellent Essay on Quicklime and Magnesia, that Calcined Magnesia, dissolves in the vitriolic, nitrous, marine, and acetous acids, and forms with them Salts, similar to those produced by the uncalcined earth with the same acids. But Mr. Mönch, a German apothecary, has asserted, that though he poured half an ounce of strong vinegar on twenty grains of Calcined Magnesia, and suffered the mixture to stand for twenty-four hours, only seven grains of the Magnesia were dissolved; and that he was unable to dissolve more than the same quantity, by digesting, in a moderate heat, an equal portion of Calcined Magnesia, in half an ounce of a mixture consisting of one part of strong vitriolic acid and six of water, for twenty hours. And, what is still more extraordinary, he could dissolve only nine grains out of twenty by boiling for a considerable time, in an ounce of the same diluted acid. But in

the nitrous and concentrated marine acids, he acknowledges, they diſſolved entirely.*

Mr. Kirwan, alſo ſays,† that this earth, perfectly dry and free from fixed air, could not be diſſolved in any of the acids without heat. But that in a heat of 180°. theſe acids, diluted with four or ſix times their quantity of water, attacked it very ſenſibly. There is no doubt but Calcined Magneſia diſſolves much leſs rapidly than the mild. The aërial acid, contained in the latter, while it is expelling, keeps up, as Bergman has juſtly obſerved, an inteſtine motion, whereby the particles of the earth are agitated and ſeparated, ſo that freſh ſurfaces are continually preſented to the Magneſia. Whereas, if an acid be added to this earth, when diveſted of air, this motion is wanting, and that part of the acid, which becomes ſaturated with the earth, envellopes the remaining earth, and prevents the immediate action of the free acid on it.‡ Continual agitation, however, will greatly promote the ſolution.

Mr. Mönch, ſeems not to have been aware of the greater quantity of acid, requiſite to diſſolve Calcined Magneſia, than would be neceſſary for the uncalcined. Nor indeed to

* Vide London Medical Journal, vol. III. p. 97.

† Philoſophical Tranſactions, vol. LXXII. p. 193.

‡ Bergman Opuſc. de Magneſia. § XIX.

have

have known the quantity required for the ſolution of the latter. I have found twenty grains of mild Magneſia require an ounce and half of diſtilled vinegar for its ſolution. This may ſeem a large quantity; but let it be remembered that, "the quantity of each baſis, "requiſite to ſaturate a given quantity of each "acid, is directly as the affinity of ſuch acid "to each baſis."* 100 grains of real vitriolic acid require 215 of vegetable fixed alkali to neutraliſe them; whereas the ſame portion of acid would be neutraliſed by 80 grains of Magneſia; and the proportional quantity of this earth to that of the alkali, neceſſary to ſaturate a given quantity of acetous acid, would be ſtill ſmaller.

But Mr. Kirwan's experiments are more worthy of attention. His accuracy in every thing he undertakes is undeniable; nor would he probably have erred, but in a caſe in which the moſt faithful Experimentaliſt might be liable to deception.

I do not know any thing more ſubject to variety than the ſolubility of pure Magneſia in acids. I have diſſolved 12 grains of aërated Magneſia in ſufficient quantities of each of the four principal acids, when I have found the earth neutraliſed. Five grains of pure Magneſia, which is equal to twelve of the aërated has

* Kirwan in Phil. Tranſ. vol. LXXIII. p. 38.

diſſolved, without heat, in the ſame quantity of the vitriolic, and even with ſmaller quantities of the nitrous and marine acids, than were neceſſary for the ſolution of the aërated. The action of the acetous acid was ſomewhat leſs complete, on the pure than on the aërated. The acids were previouſly diluted with about five times their weight of water, except the acetous which was concentrated, and the Magneſian Earth was intimately mixed with half an ounce of water, and continually agitated with a glaſs tube, till the ſolution was finiſhed.

Thus I have often made complete ſolutions of pure Magneſia. But at other times I have found it obſtinately to reſiſt ſolution, though prepared, previous to calcination, in every reſpect, ſimilar to the other, and, though, apparently, perfectly calcined. This for ſome time puzzled me exceedingly; till at laſt I diſcovered it to depend on the ſtate of calcination, and that by continuing the fire for a longer time, this inſoluble Magneſia acquired its cuſtomary ſolubility. Another circumſtance, attending the calcination of Magneſia, I have always been unable to explain. In a certain period of the proceſs, though the Magneſia were ever ſo taſteleſs before calcination, and though it, at this time, ſhews no effervescence with acids, yet it has acquired a diſagreeable, bitter, pungent taſte, ſomewhat reſembling lime. But it does not, like lime, or Magneſia containing that earth, form

form a lime-water. This obnoxious taste is also destroyed by a further extension of the calcination. On what can this property depend?

Magnesia has been described as throwing out a phosphoric light, in the latter periods of the calcination. This is a phenomenon which neither I, nor any of the persons I have employed, in the calcination of Magnesia, have ever been able to observe. Indeed I do not see how it could happen, except the Magnesia contained vitriolic acid or alkaline salt. M. Fourcroy, who mentions the fact, cites the authority of Messrs. Butini and Tingry, of Geneva;* and the process, which he has given, from the former of these Gentlemen, is very ill adapted to free the Magnesia, from the whole of the vitriolated tartar, formed in the mixture. Now, supposing aërial acid to be a compound of Air and Phlogiston, the last portions being separated with difficulty from the Magnesia, a decomposition of the Gas may take place, and a new combination ensue. The Phlogiston, quitting its aërial basis, may unite with the Earth and Vitriolic Acid, and, by this union, a Pyrophorus be formed; and, probably, from this cause, the appearances, described by these Chemists, may have proceeded.

* Fourcroy's Lectures, vol. I. p. 163, and 292.

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